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ABSTRACT

In the past 5 years, National Science Foundation (NSF) support for two-year colleges has risen from approximately $1 million per year to the current level of approximately $23 million per year. This report on the NSF's two-year college related activities in fiscal year 1994 (FY94) begins with letters of transmittal, and a brief introduction and overview. The remainder of the report is divided into the following sections: (1) Leadership Activities: Education and Human Resources, including outreach workshops, the "Gaining the Competitive Edge" workshop, the Coalition Building for Effective Faculty Enhancement workshop, a survey on technical education in two-year colleges, the Advanced Technological Education Leadership Workshop and Principal Investigator's Conference, the 1994 NSF Invitational Conference, and other publications directly involving two-year colleges; (2) Leveraged Program Support: Education and Human Resources, highlighting undergraduate, elementary, secondary, and informal education programs, human resource development, and other forms of support; (3) Leveraged Program Support: Research Directorates, focusing on the development of NSFNET, a network providing Internet access to educators and researchers; and other selected examples; (4) Technology Reinvestment Project, designed to stimulate the transition to a growing, integrated, national industrial capability providing the most advanced, affordable, military and commercial products; (5) notes on the data sources; and (6) five appendixes, including the Report of the Advanced Technological Education (ATE) Leadership Workshop, History of the ATE program, FY94 awards to two-year colleges by state, Technology Reinvestment Project Awards to two-year colleges, and a map of FY94 awards to two-year colleges. (MAB)

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NATIONAL SCIENCE FOUNDATION

ACTIVITIES IN SUPPORT OF TWO-YEAR COLLEGE SCIENCE, MATHEMATICS, ENGINEERING, AND TECHNOLOGY EDUCATION

FISCAL YEAR 1994
HIGHLIGHTS

DIRECTORATE FOR EDUCATION AND HUMAN RESOURCES
DIVISION OF UNDERGRADUATE EDUCATION

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NATIONAL SCIENCE FOUNDATION

DIRECTORATE FOR EDUCATION AND HUMAN RESOURCES
Division of Undergraduate Education

To: Neal F. Lane
Director, National Science Foundation

Luther S. Williams
Assistant Director, Education and Human Resources

From: Robert F. Watson
Division Director, Undergraduate Education
NSF's Official Liaison with Community Colleges

Date: February 16, 1995

Subject: Report: ***Activities in Support of Two-Year College Science, Mathematics, Engineering, and Technology Education: Fiscal Year 1994 Highlights***

This transmits the National Science Foundation (NSF) Report, ***Activities in Support of Two-Year College Science, Mathematics, Engineering, and Technology Education: Fiscal Year 1994 Highlights.***

I forward this report to you in my capacity as NSF's "Official Liaison with Community Colleges" as called for in the Scientific and Advanced Technology Act (PL#102-476). The Division of Undergraduate Education (DUE) is the focal point for NSF's mission in undergraduate education and as such the focal point for community colleges. Work on this report was led by Elizabeth Teles, Lead Program Director for the Advanced Technological Education (ATE) program. Valuable input was provided by Duncan McBride, DUE Section Head for Laboratory and Technology; Ashok Agrawal, Program Director for ATE; Bettye Lawrence, Program Consultant for ATE; and Philip Tavel, Science Assistant for ATE.

Two-year colleges can take pride in the quality of activities demonstrated in the projects described in this report. In the past five years, NSF support for two-year colleges has risen from about $1 million per year to the current level of about $23 million. In addition, two-year colleges are being supported through collaborative activities in which they play a major role and through leadership activities such as workshops, conferences, studies, and special projects. These projects have broad national impact for undergraduate education, particularly at two-year colleges.

Although much remains to be done, NSF can be proud of its progress in strengthening science education in the nation's two-year colleges.

I would be pleased to provide any additional information which you might wish.

Activities in Support of Two-Year College Science, Mathematics, Engineering, and Technology Education

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ACTIVITIES IN SUPPORT OF TWO-YEAR COLLEGE SCIENCE, MATHEMATICS, ENGINEERING, AND TECHNOLOGY EDUCATION

INTRODUCTION AND OVERVIEW

To meet the economic and social needs of today's society, America's colleges and universities are being called upon to produce mathematically and scientifically literate workers and citizens. The nation's two-year colleges are ideally positioned to serve as catalysts in this effort because while they serve a variety of purposes, they all have a single dominant mission -- effective education for all students. The National Science Foundation (NSF) recognizes the critical role that two-year colleges play in science, mathematics, engineering, and technology education. These colleges bring four crucial strengths to the development of our nation's resources. First, they support a great diversity of learning objectives. These include: (a) developmental education for students underprepared to begin college work, (b) technical education and other career-oriented programs, (c) courses of study that articulate with and transfer to four-year colleges and universities, and (d) additional coursework for students who have baccalaureate and other advanced degrees but desire to change careers. Second, they provide access to higher education for many who might not otherwise have the opportunity. Third, they enroll large numbers of minority and female students. Fourth, they take their service to the community seriously by offering courses designed to help upgrade the work force and renew job skills as well as activities and courses for life-long learning.

NSF plays a major role in strengthening science, mathematics, engineering, and technology programs in two-year colleges in many ways. The Foundation provides educational support to two-year colleges through leadership activities and leveraged program support. Among these are: (a) grants made directly to two-year colleges, (b) collaborative efforts in which two-year colleges play a major role, (c) support of curriculum materials and teacher activities that benefit students and faculty in two-year colleges as well as others in the academic community, and (d) workshops, conferences, studies, and other special activities.

Increased interest at NSF in two-year colleges in FY94 resulted in a more than three-fold

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increase in direct support to these institutions. As a major new initiative aimed primarily at two-year colleges, the Directorate for Education and Human Resources (EHR) established the Advanced Technological Education (ATE) program as a joint effort of the Division of Undergraduate Education (DUE) and the Division of Elementary, Secondary, and Informal Education (ESIE). Although the principal support to two-year colleges at the Foundation has been through programs in DUE, support is growing throughout other programs in EHR and the research directorates. Most of the increased support through the research directorates resulted from an increase in the number of awards from the Division of Computer and Information Science and Engineering (CISE) Directorate through the NSFNET Program for network connections .

In addition, NSF administered through the Engineering Directorate the Manufacturing Education and Training (MET) component of the Technology Reinvestment Project (TRP). NSF was assigned the lead role among 8 collaborating agencies in selection of these TRP/MET awards. Two-year colleges have received significant support through this program.

This document contains information primarily about activities for two-year colleges through the Education and Human Resources Directorate; however, some information on Foundation-wide activities is given to set the report in a broader NSF context. In particular, sections in this report describe NSFNET and the Technology Reinvestment Project (TRP).

The 209 NSF awards, excluding the TRP awards, were made to two-year colleges in 38 states plus Puerto Rico and the District of Columbia.

In FY94, there were five program directors at the Foundation whose academic backgrounds and experiences were at two-year colleges and who are recognized leaders within the two-year college community. Four were in EHR - two in the Division of Undergraduate Education (DUE); one in the Division of Research, Evaluation, and Dissemination (RED); and one in the Office of Systemic Reform (OSR). A fifth worked in the Division of Human Resource Management in the Office of Information and Research Management. In addition, a program consultant on contract from a two-year college worked full time on-site with DUE, primarily on the Advanced Technological Education (ATE) program. In FY94, DUE appointed the first NSF permanent program director from a two-year college.

The Division of Undergraduate Education (DUE) is the focal point of NSF activities in support of science, mathematics, engineering, and technology education in two-year colleges. The Division Director of DUE serves as NSF's "Official Liaison with Community Colleges" as called for in the Scientific and Advanced Technology Act (PL#102-476).

Table 1

FOUNDATION-WIDE AWARDS TO TWO-YEAR COLLEGES

	1993		1994	
Directorate	# Awards	Dollars	# Awards	Dollars
Office of Director	4	57,783	0	0
Planning and Evaluation	0	0	1	59,248
Mathematical and Physical Sciences	1	66,000	4	345,994
Social, Behavioral, and Economic Sciences	2	131,834	1	80,000
Computer and Information Science and Engineering	11	294,777	29	951,013
Geosciences	0	0	0	0
Engineering	2	272,285	1	83,451
Biological Sciences	2	647,000	6	521,895
Education and Human Resources	102	6,107,319	167	21,413,056 * Ψ
TOTAL	124	$7,576,998	209	$23,454,658 * Ψ
Technology Reinvestment Project(TRP)	0	0	8 @	2,351,222 @
TOTAL with TRPs	124	$7,576,998	217	$25,805,880 * Ψ

Ψ These figures only include those awards where 1 of the principal investigators is at a 2-year college. Data is not included on awards in which 2-year colleges are part of consortia, but principal investigators are not from 2-year colleges. There is significant support to 2-year colleges through consortia activities. See Table 2 for EHR details.

* Dollars reported in the table are only FY94 dollars. Total EHR commitment for these projects including out-year funding totals $39.3 million, for NSF excluding TRPs totals $44.2 million, and for NSF including TRPs totals $48.2 million.

@ This includes the 4 TRP/MET awards to 2 -year colleges. In addition 4 TRPs have co-principal investigators from two-year colleges. It is estimated that 25% of the dollars in these awards directly benefit two-year colleges. Many other TRPs have two-year college partners.

Table 2

DIRECTORATE FOR EDUCATION AND HUMAN RESOURCES
AWARDS TO TWO-YEAR COLLEGES

	1993		1994	
	# Awards	Dollars	# Awards	Dollars
Undergraduate Education (DUE)	93	$5,603,451	126	$14,716,362 @
Elementary, Secondary and Informal Education (ESIE)	6	329,830	33	5,966,883 @
Human Resource Development (HRD)	2	174,038	4	461,884 &
Graduate Education and Research Development (GERD)	0	0	1	3,830
Office of Systemic Reform (OSR)	0	0	1	140,000 &
Research, Evaluation, and Dissemination (RED)	0	0	2	124,098
TOTAL	102	$6,107,319	167	$21,413,056 * Ψ

@ The funds in the ATE Program were divided 2/3rds in DUE and 1/3 in ESIE. To avoid duplication of numbers, 2/3rds of the 58 awards (39 awards) have been assigned to DUE and 1/3rd (19 awards) assigned to ESIE. The total dollars have been likewise split in a ratio of 2:1. In actuality, DUE contributed funds to 55 of the 58 awards plus an additional contractual arrangement with a two-year college for total of 56 ATE awards (see Table 3) and ESIE contributed funds to 40 of the 58 awards (see Table 9).

Ψ These figures only include those awards for which a principal investigator is at a 2-year college. Data is not included on awards in which 2-year colleges are part of consortia, but principal investigators are not from 2-year colleges. There is significant support to 2-year colleges through such consortia activities. All ATE awards are included because all ATE awards had either a principal investigator or co-principal investigator at a 2-year college or included a 2-year college on a sub-contract or involved 2-year colleges as prime players. In some cases in the ATE program, the grant was made to a system or university on behalf of a consortium.

*Dollars reported are only FY94 dollars. Total EHR commitment to the projects including out-year funding totals $39.3 million.

& Two-year colleges are involved in most of the Alliance for Minority Participation (AMP) grants and Rural Systemic Initiative (RSI) awards as well as several of the State Systemic Initiatives (SSI) and Urban Systemic Initiatives (USI). In two of the AMP grants (California State and Newark), one SSI (California), and one USI (New York), there is a project director from a two-year college. Information is given on these awards elsewhere in this document, but no dollars are included in this table.

LEADERSHIP ACTIVITIES: EDUCATION AND HUMAN RESOURCES

Outreach Workshops

In 1994, DUE and ESIE sponsored a series of 13 regional workshops which were attended by over 1000 administrators and faculty members, for the most part from two-year colleges, but also from four-year institutions and secondary schools. These were sponsored by the National Science Foundation in cooperation with the American Association of Community Colleges (AACC) and other cooperating associations and colleges. AACC advertised the workshops, coordinated collection of data, and provided support to organizers. The goals of the workshops were to (a) discuss with the two-year community and their academic and industrial partners the newly initiated Advanced Technological Education (ATE) program, (b) encourage quality proposals to NSF programs, (c) provide information on other NSF programs of interest to two-year colleges, and (d) give the two-year college community an opportunity to interact with NSF program officers.

The workshops were held with:

Maricopa Community College	Phoenix, Arizona
International Technology Education Association (ITEA)	Kansas City, Kansas
Fifth National Conference on College Teaching and Learning	Jacksonville, Florida
American Association of Community Colleges (AACC)	Washington, DC
Southeastern National Council for Resource Development	Nashville, Tennessee
National Coalition of Advanced Technology Centers	Springfield, Mass
American Society for Engineering Education	Edmondton, Canada
Chicago Public Schools and City Colleges of Chicago	Chicago, Illinois
Two-Year Colleges in Mid-Atlantic Region North and NJ National Council for Resource Development	Edison, New Jersey
Houston Community College System	Houston, Texas
California Community College System	
Southern California	San Marcos, California
Northern California	Saratoga, California
Two-Year Colleges in Mid-Atlantic Region - South	Catonsville, Maryland

In addition, NSF Program Directors gave numerous presentations and workshops at professional

meetings involving two-year colleges. Those listed below with an asterisk involved primarily two-year colleges while others involved significant numbers of two-year college faculty. Among these were: the American Mathematical Association of Two-Year Colleges (AMATYC) *, the National Association of Biology Teachers (NABT), the American Chemical Society (ACS), the American Association of Physics Teachers (AAPT), the Mathematical Association of America (MAA), the West Virginia Community College Association *, the Pennsylvania State University System Technology Educator's Conference *, the League for Innovation's Workforce 2000 *, the Mid-Atlantic Society of Engineering Education, the National Council for Resource Development (National Convention *, Washington Workshops*, Florida Regional Meeting), South Carolina Department of Education *, St. Lawrence Section of ASEE, American Association for the Advancement of Science (AAAS) Two-Year College Initiative Planning Meeting, Tech Prep National Conference in Atlanta, Georgia *, International Conference on Technology in Collegiate Mathematics, Quality Education for Minorities (QEM) *, and others.

Gaining the Competitive Edge: Critical Issues in Science and Engineering Technician Education

This NSF/FCCSET (Federal Coordinating Council for Science, Engineering, and Technology) workshop, ***Gaining the Competitive Edge: Critical Issues in Science and Engineering Technician Education (NSF 94-32)***, was a natural extension of recent workshops, studies, and reports supported by NSF to help improve science, mathematics, engineering and technology education in the United States. The workshop held July 21 - 23, 1993 in Washington, D. C. was in response to a nationally recognized need for a well-educated technical work force in the high performance work place of advanced technologies. The workshop was timely because it has become increasingly apparent that for the United States to maintain a competitive edge in the world market, the technical component of the work force must be better prepared. The purpose of the workshop was to identify critical issues in science and engineering technician education; develop recommendations for industry, academe, and government; and engage these communities into action. Deliberations focused on development of strategies to strengthen two-year college technician education programs; however, improving education programs for prospective technicians at the secondary school level and expanding opportunities for technicians at four-year colleges and universities and after employment were addressed as well. The workshop report (NSF 94-32) was published in May of 1994.

Coalition Building for Effective Faculty Enhancement

In October of 1993 the Division of Undergraduate Education sponsored a workshop on ***Coalition Building for Effective Faculty Enhancement***. Participants included principal investigators from two- and four-year coalitions supported under the Undergraduate Faculty

Enhancement, Course and Curriculum, and Calculus projects plus selected other individuals who had expertise relative to coalitions. The goals of the workshop were to:

- develop a guidebook that could be used by individuals who are planning and leading coalitions,
- identify needs of community college faculty relative to faculty enhancement,
- generate increased interest from the scientific community in forming cooperative and collaborative projects,
- increase interest in interdisciplinary projects, and
- discuss evaluation and dissemination for coalition projects.

The guidebook, recently published by Prince George's Community College, is entitled ***Putting the Pieces Together: A Guide Book for Leaders of Coalitions of Two- and Four-Year Colleges and Universities*** and can be obtained by writing to Dr. Patricia Cunniff, Science and Technology Resource Center, Prince George's Community College, 301 Largo Road, Largo, Maryland 20772. .

Survey on Technical Education in Two-Year Colleges

In 1993, NSF's Division of Science Resource Studies (SRS) in cooperation with the Division of Undergraduate Education (DUE) and the Division of Research, Evaluation, and Dissemination (RED) conducted a survey on technical education in two-year institutions. This was the first study conducted by NSF on technical education. The report provides data on aspects of engineering and science technology education in the nation's two-year colleges including numbers of two-year colleges involved in science and engineering technology; numbers of certificates and associate degrees awarded; enrollment and faculty in these programs; fields of study; linkages between technology programs and local businesses and industry including co-op, worker training and re-training, and school-to-work; linkages between technology programs and secondary schools including Tech-Prep; and transfer arrangements with four-year institutions. The report ***Technical Education in 2-Year Colleges: HES 17*** can be obtained either through DUE or SRS.

Advanced Technological Education Leadership Workshop and Principal Investigator's Conference

On October 27, 1994, the NSF's Advanced Technological Education (ATE) Program, in cooperation with the AACC, sponsored an ATE Leadership Workshop preceding the first Principal Investigator's Conference for the ATE program. The Leadership Workshop involved education leaders from two- and four-year colleges, universities, and secondary schools; leaders

from industry with interest in technical education; and representatives from professional societies. The Principal Investigator's meeting involved the 3 newly awarded ATE Centers, the 16 ATE planning grants for Centers, and about 6 of the large curriculum development projects.

The Leadership Workshop participants were asked to consider three issues: (a) When industry hires a technician, do they expect to invest resources in continual development of skills or do they expect the technician to fill only positions for which they are initially prepared? (b) What does industry want technicians to know and be able to do upon the completion of an associate degree? (c) How can the ATE program have a national impact on technological education to serve industry needs? and (d) How can industry, NSF, four-year institutions, and two-year colleges work together to maximize the impact of the ATE program?

The Principal Investigator's meeting was designed to help ATE award recipients begin to think of the ATE program more broadly than just their own projects and to think of how the ATE program as a whole can impact and improve technological education in this country.

The Principal Investigator's meeting was divided into four parts:

1. On Thursday evening participants concentrated on looking at technician education from the standpoint of the workplace. The Plenary Speaker was the Director of College and University Relations for the Boeing Company. Conference representatives, at this time including both those from the Principal Investigators' meeting and those from the Leadership Workshop, looked at the questions of: (a) How can industry and education work together to assure a technological competent and competitive workforce? How can the ATE program support innovative and comprehensive approaches, not just business as usual or projects which initially succeed, but make no lasting differences? (b) What are the challenges to implementing more flexible and innovative programs? and (c) How can industry and education work together to ensure that faculty possess subject matter competence and effective pedagogical skills required to help students attain the highest level of technical competence?

2. Friday morning participants considered technician education from the standpoint of educational institutions. Representatives from secondary schools, NSF, two-year colleges, four-year institutions, and AACC made background remarks. Attendees then addressed the following questions: (a) How can the secondary school curricula best provide a foundation for the future technician? (b) How can education assure appropriate levels of science, mathematics, and technology for science and engineering technicians in associate degree programs? (c) How can specific science and engineering technology courses change to take into account changes in industry needs? (d) What is the role of education and industry in providing for changing workplace needs? and (e) How can articulation between two-year colleges and four-year institutions be improved as a result of ATE activities?

3. Friday afternoon ATE principal investigators in cooperation with NSF considered the following technical issues for centers and projects: management, reports to NSF, assessment

and evaluation, record keeping, standards, and business policies.

4. Saturday morning was divided into two parts. During the first half, projects and centers with a common theme had an opportunity to plan next steps appropriate to their needs. During this time the attendees were divided into groups representing science technologies, engineering technologies, and core curriculum. During the second half, recipients of different type awards worked with NSF Program Directors planning their next steps and discussing technical aspects of their awards and reporting needs. At this time attendees were divided into Centers, Planning Grants for Centers, and Projects.

A summary of recommendations from the Leadership Workshop is included in Appendix I.

1994 NSF Invitational Conference

At the NSF 1994 Invitational Conference, ***Building the System: Making Science Education Work*** (NSF 94-107) a session focused on *The New American Work Force: Scientific and Technical Development* and two exhibits demonstrated innovative new approaches to technician education. Among the issues discussed in the session were:

- Education versus training;
- Content base of basic science and mathematics;
- Articulation and collaboration among institutions;
- Avoidance of dead-end tracking;
- Complexity of the diverse student population entering technical fields; and
- Role of "tech-prep" in attracting, motivating, and training future technicians.

A briefing paper for the conference entitled *Technician Education: The Future of the U. S. Work Force* is included in the proceedings.

Other Publications Directly Involving Two-Year Colleges Published Between 1991 and 1994 of Interest:

Matching Actions and Challenges: Report of a National Science Foundation Workshop on Science, Engineering, and Mathematics Education in Two-Year Colleges (NSF 91-111). The focus of this workshop was to reaffirm the important role two-year colleges play in science, mathematics, engineering, and technology (SMET) education. Recommendations are intended for two-year college faculty; professional societies; presidents and administrators; and state, local, and national funding agencies. Published in 1991.

Partners in Progress: Report of a National Science Foundation Workshop on the Role of Professional Societies in Two-Year College Science, Technology, Engineering, and Mathematics Education (NSF 93-64) This report contains recommendations from both interdisciplinary and disciplinary working groups for professional societies actions to support the integrated teacher-scholar role of two-year college STEM faculty, encourage the formation of networks among STEM faculty, promote membership and leadership by two-year college faculty, enhance STEM education in two-year colleges, and increase funding to two-year college STEM faculty. Published in 1993.

Activities in Support of Two-Year College Science, Engineering, Technology, and Mathematics Education: Fiscal Year 1993 Highlights (NSF 94-86). This report gives the highlights of NSF support to two-year colleges through both leadership activities and leveraged program support. Abstracts are included for awards made through the Division of Undergraduate Education. Published in 1994.

2nd Annual Conference on Diversity in the Scientific and Technological Workforce (NSF 94-12): This report contains the report on a session organized around the topic of *Transition of Students From Two-Year to Four-Year Colleges*. This session dealt with the successful transition of minority students to four-year institutions. The objectives of the session were to develop strategies for achieving the broader goal of a significant increase by the year 2000 of minority students enrolled in science and engineering in two-year colleges that successfully transfer to four-year institutions. Published in 1994.

LEVERAGED PROGRAM SUPPORT: EDUCATION AND HUMAN RESOURCES

Division of Undergraduate Education

Faculty members who vigorously combine teaching with scholarship are essential to the creation of vital science, mathematics, engineering, and technology education. The Foundation seeks to provide incentives and rewards to stimulate and motivate faculty members so that creative teaching and instructional scholarship become a part of the "faculty culture" at all institutions. Faculty members who are primarily teachers need opportunities to deepen their knowledge as well as opportunities to work in the creative renewal of undergraduate courses, curricula, and laboratories.

DUE provided direct support to two-year colleges in FY94 through the following programs:

- **Advanced Technological Education (ATE)** program for the development of courses, curricula, and faculty and teacher preparation and enhancement to improve the quality of the education for science and engineering technicians;
- **Instrumentation and Laboratory Improvement (ILI)** program for the development of new or improved laboratory courses or experiments;
- **Course and Curriculum Development (CCD)** for projects to improve the quality of courses and curricula;
- **Calculus and the Bridge to Calculus** to foster improvement in the quality of calculus instruction and preparation for calculus on a national scale; and
- **Undergraduate Faculty Enhancement (UFE)** to enable faculty members to learn about new techniques and developments in their fields.

The **Collaboratives for Excellence in Teacher Preparation** program also involved two-year colleges in collaborative activities with four-year colleges and universities. Two-year colleges serve both (a) undergraduate students who are part of the future K-12 teaching workforce and (b) returning students with undergraduate degrees who lack the mathematics and science needed for certification. Two-year colleges are involved in all Collaboratives. For example, two-year colleges play a major role in the Collaborative award to Montana State University. Six two-year tribal colleges are among the twelve participating institutions of higher education in the state.

The primary focus of the Montana Collaborative is to increase the number of Native Americans in the nation's teaching workforce who are well-educated in science and mathematics. This Collaborative recognizes that two-year colleges are vital to this effort. 14 of the 42 students who received NSF scholarship support in Montana are currently attending tribal, two-year colleges. The Rocky Mountain Collaborative also involves two-year colleges in substantive ways. Faculty from both two-year and four-year institutions are addressing reform in chemistry, mathematics, and diversity initiatives.

Two-year colleges were involved in most of the planning grants made in the newly initiated **Systemic Changes in the Chemistry Curriculum**. For example CUNY City College and partner community colleges in New York City have a project to redesign and modernize the undergraduate chemistry curriculum which focuses on a new teaching model - Workshop Chemistry. The University of Wisconsin-Madison and the Madison Area Technical College through the New Traditions Project are impacting the chemistry curriculum and also technician education by innovations in several areas: student-focused active learning; inquiry-based, open-ended laboratories; interdisciplinary courses; topic oriented curriculum; and information technology/computer tools.

Six of the fifteen planning grants made in new **Mathematical Sciences and Their Applications Throughout the Curriculum** involve two-year colleges in major ways. For example, New Mexico Institute of Mining and Technology, Navajo Community College, San Juan Community College, and Sandia National Laboratories are working together to develop and implement innovative approaches to mathematics across the curriculum. Faculty from mathematics, physics, geoscience, biology, and engineering are developing integrated and coordinated projects. Nassau Community College and other two-year colleges on Long Island are working with the State University of New York at Stonybrook and other colleges on Long Island to change the culture among quantitative departments to produce cooperation and improved instruction in mathematics aspects of the curriculum and to create new courses and curricular mathematically based disciplines.

Table 3

DIVISION OF UNDERGRADUATE EDUCATION
FY94 GRANTS TO TWO-YEAR COLLEGES BY PROGRAM

Program	Number of Awards	Dollars
ILI	60 ω	$2,461,802 ω
CCD	14 Ψ	1,192,076
UFE	13	1,748,518
ATE	56 @ ω	9,177,200 ω
Other	2	136,766
Totals	142 ω	$14,482,662 * ω

Ψ Includes awards in Course and Curriculum (9), Calculus (2), Chemistry Initiative (1), Mathematical Sciences Initiative (1), and Science and Humanities (1).

@ DUE contributed funds to 55 of the 58 awards made in the ATE program. The dollars reported are 2/3rds of the total dollars awarded since the funds were divided 2/3rds DUE, 1/3rd ESIE. In addition, DUE through the ATE program funded one contractual arrangement with a two-year college.

ω ATE and ILI co-funded three projects which are listed under both ILI and ATE under number of awards; however, only the dollars each contributed are listed in the dollars column. ILI contributed funds to 3 other ATE projects where the number of projects is listed only under ATE, but the dollars are reported under ILI. The total number of awards listed is reduced by 3 to avoid double counting.

* Dollars reported are only FY94 dollars. Total commitment for these awards including out-year funding totals $24.8 million.

Table 4

DIVISION OF UNDERGRADUATE EDUCATION
GRANTS TO TWO-YEAR COLLEGES
BY PROGRAM FY90, FY92, AND FY94

Program	1990	1992	1994
ILI	48	53	60 ω
CCD	1	12	14
UFE	1	8	13
ATE	-	-	56 ω
Other	0	0	2
Totals	50	73	142 ω

ω See Table 3.

Advanced Technological Education

Both Congress and the White House have emphasized the importance of the technical work force in a global competitive economy. The *Scientific and Advanced Technology Act of 1992* called for the National Science Foundation to establish a national program to improve the education for technicians in advanced technology fields utilizing the resources of the nation's two-year colleges. In August 1993, NSF announced the ***Advanced Technological Education*** (**ATE**) program (NSF 93-132). These efforts have created a sound foundation for cultivating innovative programs to advance technological education in the United States. The purpose of the new ATE program is to promote exemplary improvement in advanced technological education at the national and regional level through support of curriculum development and program improvement for technicians being educated for the high performance workplace of advanced technologies. The focus of the ATE program is the development of strategies to strengthen two-year college technician education as well as improving the education of prospective technicians at the secondary school level. Expanding opportunities for technicians at four-year colleges and universities and after employment are also addressed. Those projects and centers supported through the ATE program will result in major improvements in advanced technological education, build collaborations among academic institutions and between academe and industry, serve as models for other institutions, assure that students acquire strong backgrounds in mathematics and science, and yield nationally-usable educational products. **A full report on the FY94 ATE program can be found in the NSF publication *Advanced Technological Education: 1994 Awards and Activities* (NSF 95-6).** Please consult this document for a more comprehensive description of the program including abstracts of awards. The FY94 ATE program was managed in the Division of Undergraduate Education (DUE) in cooperation with the Division of Elementary, Secondary, and Informal Education (ESIE).

The Advanced Technological Education (ATE) program, new at the National Science Foundation (NSF) this year, specifically addresses the education of science and engineering technicians. Dr. Luther Williams, NSF Assistant Director for Education and Human Resources (EHR), says "It has become increasingly apparent that for the United States to be competitive in the world market, the technical component of the work force in the United States must be better prepared than the corresponding work force in other industrialized countries. The Advanced Technological Education (ATE) program is a major new NSF initiative in response to this challenge."

To improve the quality of advanced technological education in science and engineering technology fields, as well as the basic mathematics and science core underlying such programs, the National Science Foundation through the ATE program awarded 58 grants in FY1994. These awards, which total about $13.4 million for the first year and $26.9 over three years, support 3 Centers of Excellence, 16 planning grants for Centers of Excellence, and 39 projects that result in reform in technological education.

This year the ATE program is supporting projects in curriculum and laboratory development, teacher preparation, and faculty and teacher enhancement in addition to the planning grants for Centers and a few Centers of Excellence. Robert Watson, Director of DUE and the official liaison between the Foundation and two-year colleges, says "This program exemplifies NSF's concern for the education of all students. The scientific and technical educational community, along with business, industry, and professional societies, have been very interested, excited, and supportive of this new program at NSF. Projects and centers funded will make major reforms in the education of science and engineering technicians in strategic advanced-technology fields."

The projects represent collaboration of two-year colleges with secondary schools and four-year institutions. Intellectual partnerships with business, industry, and government are featured. All projects demonstrate a leadership role in technician education which includes plans for curriculum, faculty, and teacher development. They will serve as clearinghouses and service centers for reform in the education of science and engineering technicians. According to Margaret Cozzens, Division Director for ESIE, "Mounting a major national effort to improve the education of technicians requires that all groups involved in technician education become proactive. With support from the National Science Foundation and others who share the vision, it will be possible to make a difference in how science and engineering technicians are educated at all levels in this country."

The awards cover a wide range of advanced technological fields including biotechnology, environmental technology, computer technology, chemical technology, manufacturing technology, electronics, biomedical engineering technology, geographic information systems technology, instrumentation and calibration technologies as well as the mathematics, physics, chemistry, biology, and other core courses which serve to undergird such programs. For example:

- The Environmental Education Technology Center, which is a joint effort of Eastern Iowa Community College, Kirkwood Community College, Hazardous Materials Training and Research Institute (HMTRI), and Partners for Environmental Education (PETE), involves over 300 community colleges in their dissemination efforts. The Center is developing nationally validated curriculum models and instructional materials; establishing comprehensive programs of professional development; serving as a clearinghouse for environmental education information; and acting as a hub for the networking of environmental educators, business and industry, federal agencies, and professional societies.

- The Advanced Manufacturing Center is a joint effort of Sinclair Community College, the University of Dayton, numerous local industries, and secondary schools. The Center also involves community colleges in three other states in the development stage with significant other two-year college involvement planned for the beta testing stages. The Center is acting as catalyst to improve science, mathematics, and advanced manufacturing instruction by developing an advanced manufacturing curriculum beginning in grade 11 through the associate degree program, and culminating in a bachelor's degree; writing, pilot testing, and publishing curriculum materials; and disseminating the curriculum, instructional materials,

and model program nationally. The Center is housed in a state-of-the-art new building on the Sinclair campus.

- The distance education consortium led by Texas Technical College in Sweetwater involves many institutions in Texas, New Mexico, and Oklahoma. The project is developing the infrastructure and pedagogy to deliver technical courses through distance learning. These include existing courses in CAD/CAM/CIM as well as new AAS programs in polymer technology and electro-mechanical technology to complement needs of local industry.

NSF selected the sixteen proposals for planning grants for centers for their strong individual potential to become Centers, and because they offer a rich diversity of approaches to comprehensive changes in advanced technological education. The 16 planning grants for centers are in 14 different states. Even though the planning grants are centered in 14 states, 20 states are represented among the coalitions. For example, the Planning Grant for a Center in Aerospace Engineering Technology at Brevard Community College in Florida has community colleges in Alabama, Virginia, Maryland, Ohio, Texas, Mississippi, and California as partners. In addition, many of the projects have significant outreach to institutions in other states. The planning grant for a Center in Chemical Technology Education in Nebraska currently has outreach to institutions in at least 16 other states.

The 20 largest projects are curriculum development projects which plan to develop and test curriculum nationwide, although most also have a significant faculty enhancement component involved.

- A consortium composed of 15 community colleges in Kentucky plus the University of Kentucky and the Kentucky Tech Prep programs is developing a project to significantly effect both the mathematics and computer science core of the technology programs in Kentucky as well as create a new associate degree program in telecommunications. The project is reforming the mathematics and calculus curriculum which undergirds the programs for technicians, developing an associate degree program in telecommunications and computer management, networking the community colleges, and providing significant faculty development activities.

- The Miami University Middletown project is affecting 600 pre-college teachers and college faculty in faculty enhancement workshops and 20 in curriculum development efforts. Assuming each teacher or faculty member directly impacts 100 chemistry or chemical technicians students per year, this will result in 60,000 students being ultimately impacted by the project. Activities include curriculum development, instructional materials development, faculty and teacher enhancement, and student enhancement, and outreach. An industrial internship program for high school and college teachers is an important component.

- Mesa State College, Navajo Community College, and Northern New Mexico Community College in cooperation with other tribal and tribally related colleges are creating an interdisciplinary environmental technology degree program. The project is also providing faculty enhancement, instructional materials, and a rotating equipment program.

For the November 1, 1993 deadline for preliminary proposals, the ATE program received 76 preliminary proposal for centers and 214 preliminary proposals for projects requesting a total of $450 million dollars. The ATE Program received 202 formal proposals, 68 proposals for planning grants for Centers, 16 proposals for Centers, and 118 proposals for projects. ATE partially or fully supported 7 projects submitted to other programs that directly benefited technician education. In the first year of the program, the funding rate was 24.3%. These awards went to institutions in 26 states, the District of Columbia, and Puerto Rico.

Table 5

ADVANCED TECHNOLOGICAL EDUCATION (ATE) AWARDS
FY94 AWARDS BY TYPE OF TECHNOLOGY

Type of Technology	Number of Awards	
Science Technologies		
Biotechnology	6	
Chemical Technology	4	
Computer Technology	3	
Environmental Technology	5	
		18
Engineering Technologies		
Manufacturing	5	
Electronics	5	
Aerospace Technology	2	
Other (GIS, Civil, etc.)	4	
		16
Core Courses		
Mathematics	6	
Physics	2	
Technology Education	2	
Multidisciplinary/Interdisciplinary	13	
		23
Special (AACC)		1
Total		58

The planned national impact of the ATE program is large, especially that of the 3 Centers and large curriculum and faculty enhancement awards. The Environmental Center which is a joint

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effort of Eastern Iowa Community College, Kirkwood Community College, Hazardous Materials Training and Research Institute (HMTRI), and Partners for Environmental Education (PETE) involves over 300 community colleges in their dissemination efforts. They estimate that in the first 3 years of their award, they will directly impact 300 community college teachers, 300 pre-college teachers, and 5500 students. As a secondary effect, each of the 600 teachers is expected to teach an average of 100 students per year in environmental programs or literacy programs which gives the projected impact around 60,000 students during the award period. The Advanced Manufacturing Center significantly involves community colleges in three other states in the development stage with significant other involvement planned in beta testing stages. It is estimated that the projected three year impact of the first year of ATE awards will be approximately 7000 teachers and faculty and over 800,000 students.

Instrumentation and Laboratory Improvement

The Instrumentation and Laboratory Improvement (ILI) program supports the development of new or improved laboratory courses or experiments in science, mathematics, engineering, or technology. The dominant part of the program is Instrumentation Projects (ILI-IP) which provides matching grants for equipment to carry out a proposed project. These projects then serve as models for the use of instrumentation at other institutions. Grants in the ILI program have been made to over 200 departments in two-year colleges over the past four years. For example, SUNY Technical College at Delhi is using graphing calculators and imaging power of computers to enhance calculus, differential equations, and finite mathematics. The project focuses on qualitative properties of mathematics problems and the interdisciplinary applications of mathematics. Parkland College is introducing programmable logic controllers (PLCs) into an electrical power curriculum. This allows Parkland to provide PLC education for electronics technicians and for maintenance electricians in line with needs of local industries. Fox Valley Technical College is providing an integrated approach to the laboratory component of a Pulp and Paper Chemical Technology Associate Degree program to respond to the need of the local paper industry for graduates to work in integrated and automated manufacturing and research operations.

The Leadership in Laboratory Development projects (ILI-LLD) portion of the program supports the intellectual effort needed to develop national models for undergraduate laboratory instruction. The ILI-LLD supports project costs beyond equipment. For example, Spokane Community College is developing a series of minicourses entitled *Chemistry in Modern Society: Fundamental Concepts and Practical Applications*. About 10 two-hour laboratories are designed for each of five minicourses carrying 1 credit each. These minicourses include fundamental concepts, nuclear, environmental, art, and pharmacological applications of chemistry.

Table 6

ILI Proposal Activity By Type Institution FY 93 and FY94

	1993			1994		
	# Proposals	# Awards	Success Rate	# Proposals	# Awards	Success Rate
Doctoral Institution	970	170	17%	666	164	25%
Four-Year Institution	1022	337	33%	907	334	37%
Two-Year Institution	204	63	31%	200	59	30%
Totals	2197	569	26%	1773	557	31%

Undergraduate Faculty Enhancement

The Undergraduate Faculty Enhancement (UFE) program supports projects that enable faculty members who teach undergraduate education to gain experience with recent advances and new experimental techniques in their fields and learn new ways to incorporate these into undergraduate instruction. Projects are regional or national in scope and typically consist of hands-on workshops or short courses, along with follow-up activities. For example, Jamestown Community College and the Association for Computing Machinery (ACM) are sponsoring a workshop to enhance the background of faculty teaching computing sciences at two-year colleges that serve large numbers of native Americans. Participants learn about computing science topics and methodologies to be offered in associate degree programs as identified in the recently completed two-year college computing curricula recommendations of ACM. Through contact with industry representatives, participants also become aware of current employment practices, opportunities, and issues. Many UFE workshops are held on two-year campuses to encourage collaboration of faculty from many types of institutions. One of the two workshops on *Teaching Differential Equations with Computer Experiments* was held at West Valley College, a two-year institution. West Valley is one of six members of a consortia which also includes Harvey Mudd College, St. Olaf College, Rensselaer Polytechnic Institute, Cornell

University, and Washington State University. Three of the eight workshops supported under an award to the Mathematical Association of American for the Interactive Mathematics Text Project were given at two-year colleges.

A major component of UFE is regional coalitions of two- and four-year colleges and universities. FY94 represented the third year of the initiative to encourage such coalitions. The coalitions include activities to help faculty learn about new advances in their disciplines and to incorporate these developments into the curriculum. Continuing activities are very important to ensure interaction among coalition members; for that reason coalitions are usually funded for a period of two to three years. The first round of coalitions began during the summer of 1992. In FY93, eight new coalitions were started involving more than $800,000 in NSF support. In FY94, nine new coalitions were formed involving more than $1,200,000 in NSF support. A total of 18 projects were supported in FY94 either through new or continuing awards. These include coalitions of two-year institutions, coalitions of two- and four-year institutions, or projects at four-year institutions primarily for two-year faculty. For example, the University of Maryland College Park, Montgomery Community College, and Prince George's Community College formed a coalition of two- and four-year institutions in the Maryland and District of Columbia area to explore visual thinking in mathematics. Mathematics topics are chosen from chaotic dynamics and fractal geometry. Academic year programs are being conducted in which participants continue the mathematical and curricular dialogue begun during the workshops. Texas A & M University and Lee College formed a coalition for the two-year colleges in Texas. These workshops focus on recent developments in physics research, innovative physics teaching methods, and successful techniques for recruiting local minority students into two-year college science and engineering programs.

Table 7

1994 Coalitions of Two-Year and Four-Year Institutions (New and Continuing Projects)

Discipline	Number of Projects
Chemistry	1
Computer Science	1
Engineering	3
Geosciences	0
Interdisciplinary/Multidisciplinary	3
Life Sciences	1
Mathematics	7
Physics	2
Social Sciences	0
Total	18

Community college faculty also attend many of the other workshops supported by the UFE program. The table below estimates the number of faculty who have attended faculty enhancement workshops. While some data may be missing, the percents are representative.

Table 8

INSTITUTIONAL AFFILIATION OF PARTICIPANTS IN UFE-SUPPORTED WORKSHOPS

	1992 99% (88/89) Reporting		1993 66% (74/112) Reporting		1994 91 % (69/76) Reporting	
	Number	% Total	Number	% Total	Number	% Total
Two-Year Col.	594	29%	427	24%	624	30%
Four-Year Col.	610	30%	547	30%	638	31%
Universities	834	41%	839	46%	791	39%
TOTAL	2038		1813		2053	

Course and Curriculum Development Programs

Course and Curriculum Development

The Course and Curriculum Development program supports projects to improve the quality of courses and curricula in science, mathematics, engineering, and technology. It encompasses activities affecting the learning environment, content, and experience of instruction. This component seeks projects that envision major changes with potential national impact that result in widely disseminated products such as textbooks, software, and teaching materials. For example, Greenfield Community College is developing the TEME (Totally Enclosed Modular Environments) model as the experiential laboratory of the Human Ecology Curriculum. This project includes an oceanographic research simulation which provides college and secondary school students an opportunity to participate in a hands-on science educational experience. Faculty at the two two-year campuses of Miami University (Middletown and Hamilton) are revising the general chemistry course to make it more interesting, relevant, and accessible to students with various academic backgrounds. This effort involves the design, development, and testing of discovery-based laboratories scenarios and supplements which illustrate topics in chemistry through activities that extend beyond the classroom. CUNY Queensborough in New York is modernizing its electrical and computer engineering technology courses. The project

employs a comprehensive mastery of material, heightens student academic participation and achievement, emulates an industrial work place environment, and enhances academic and employment opportunities for students. Catonsville Community College is incorporating learning strategies with an emphasis on improving scientific literacy, especially critical thinking and problem solving, into a psychological biology course.

Calculus and the Bridge to Calculus

The purpose of the Calculus Program is to foster improvement in the quality of calculus instruction on the national level. Supported projects include large-scale calculus revision programs, implementation at large institutions or by consortia of institutions, new calculus development projects, and preparation for calculus projects. For example, Peralta Community College District, San Francisco City College, California State University Haywood, and San Francisco State University are preparing faculty to adapt and implement the Harvard Calculus Consortium and evaluating the impact of the programs on student learning. The Maricopa Community College System, with over 100,000 students on 11 campuses, is developing a new bridge to calculus program. Indian River Community College in Florida is developing instructional materials to support the Harvard Consortium materials. The teacher supplement contains examples of using the graphing calculator as an instructional tool, including generation of real data using the Calculator Base Laboratory System (CBL). The materials integrate practical applications taken from astronomy and physics and other disciplines that use mathematics. Dutchess Community College in New York continues to create an integrated calculus/physics sequence. The Maricopa Community College System is developing a sequence of "bridge-to-calculus" courses in cooperation with Arizona State University. A consortia of two- and four-year institutions in the state of Washington continues to disseminate and adapt as well as evaluate the use of both the Duke and Harvard materials throughout the state.

Many community colleges are being affected by other calculus reform efforts. SUNY Suffolk Community College is part of the Harvard Calculus Consortium. Montgomery College is part of the Howard Consortium. Four community colleges are part of the Sam Houston State calculus project. In addition, many two-year colleges have adopted the reform calculus texts supported through the NSF Calculus Program.

Leadership Opportunity in Science and Humanities Education

The Division of Undergraduate Education, the National Endowment for the Humanities Division of Education (NEH), and the Department of Education's Fund for the Improvement of Post-Secondary Education (FIPSE) have established the Leadership Opportunity in Science and Humanities Education (CCD-LOSH). The program seeks projects for the development of undergraduate courses and curricula that meaningfully link the study of science and the humanities. For example, Middlesex Community College is developing faculty seminars and subsequently four core courses involving environmental, industrial, sociological, and literary histories of Lowell, Massachusetts.

Division of Elementary, Secondary, and Informal Education (ESIE)

Programs are designed to improve the educational experiences of all students in school settings and to increase and improve the opportunities for all individuals to explore science, mathematics, and technology beyond the school setting. The Division seeks to achieve these goals by supporting projects to develop and implement high-quality instructional materials; enhance the mathematical, scientific, pedagogical, and technological knowledge of teachers and create a cadre of teacher change-agents; and provide stimulating environments outside of school to increase the understanding and appreciation of science and mathematics and their applications by individuals of all ages.

ESIE directly supported to two-year colleges in FY94 through the following programs:

- **Advanced Technological Education (ATE)** for the development of courses, curricula, and faculty and teacher development to improve the quality of the education for science and engineering technicians.
- **Teacher Enhancement (TE)** for the professional development programs that lead to a new level of teacher competence and a supportive school culture that empowers teachers to engage all students in science, mathematics, and technology education.
- **Young Scholars (YS)** to excite students in grades 7 - 12 about science, mathematics, and technology and to encourage them to investigate and pursue careers in these fields.

Table 9

DIVISION OF ELEMENTARY, SECONDARY, AND INFORMAL EDUCATION (ESIE)
FY94 GRANTS TO TWO-YEAR COLLEGES BY PROGRAM

Program	Number of Awards	FY94 Dollars
TE	6	$1,057,731
YS	8	430,152
ATE	40 @	4,479,000
Totals	54	$5,966,883 *

@ ESIE contributed funds to 40 of the 58 awards made in the ATE program. The dollars reported are 1/3rd of the total dollars awarded since the funds were divided 2/3rds DUE, 1/3rd ESIE.

* Dollars reported are only FY94 dollars. Total commitment for these awards including out-year funding totals $13.0 million.

Advanced Technological Education

The purpose of the new ATE program is to promote exemplary improvement in advanced technological education at the national and regional level through support of curriculum development and program improvement for technicians being educated for the high performance workplace of advanced technologies. The focus of the ATE program is the development of strategies to strengthen two-year college technician education as well as improving the education of prospective technicians at the secondary school level. Expanding opportunities for technicians at four-year colleges and universities and after employment are also addressed. Those projects and centers supported through the ATE program will result in major improvements in advanced technological education, build collaborations among academic institutions and between academe and industry, serve as models for other institutions, assure that students acquire strong backgrounds in mathematics and science, and yield nationally-usable educational products. For example, the American Chemical Society is developing, in collaboration with two-year college faculty, curriculum materials for secondary school chemistry technology programs which will prepare students to enter chemistry technician programs and other technical programs in two-year colleges. The project is entitled *Science Technology: Knowledge and Skills*.

A full report on the FY94 ATE program can be found in the NSF publication *Advanced Technological Education: 1994 Awards and Activities* (NSF 95-6) and a more complete description in the section of this document on undergraduate education. Please consult this document for a more comprehensive description of the program including abstracts of awards.

Teacher Enhancement

All teachers must continue professional development and renew career commitments. Well-prepared teachers need to engage in activities that enrich and strengthen their teaching; to influence and improve the teaching of their colleagues; and to be recognized for their efforts. Teacher Enhancement (TE) supports development of effective approaches and creative materials for the continuing education of elementary, middle, and secondary teachers of science, mathematics, and technology. Successful projects emphasize both content and pedagogy; help teachers develop and exercise leadership qualities; and provide opportunities for continuing professional growth and interaction. Projects typically involve intensive summer workshops followed by activities during the academic year. For example, Sinte Gleska College Center is developing leadership teams and educating teachers to improve mathematics and science education for American Indian elementary students. Teachers attend three years of the project and in the third year act as mentors and facilitators. Administrators from target schools also attend for at least one week during one summer institute and fully participate in mathematics and science education at their schools.

Young Scholars

Commitment and preparation for careers in science, mathematics, engineering, technology, or education in these fields begin during secondary school years. The Young Scholars (YS) Program, which targets high-potential and high-ability youth in grades 7 - 12, is designed to inform and excite students about these disciplines and to encourage them to investigate careers in these fields. The YS program strongly emphasizes student participation in the process of scientific discovery through interaction with practicing scientists and science educators both in the laboratory and in the field. Projects offer a combination of instruction, research, and problem-solving activities along with a discussion of career preparation and science ethics. For example, Atlanta Metropolitan College is providing a YS project in chemistry and mathematics designed to enhance the scientific and mathematical awareness of minority and female students. Students are involved in classroom discussions and lectures as well as laboratory and field experiences stemming from an investigation into the chemistry of the environment. Students also investigate concepts involved in mathematical modeling.

Division of Human Resource Development

The programs in the Division of Human Resources Development (HRD) reflect the Foundation's commitment to developing the resources of the scientific and technical community as a whole. The Division has primary responsibility for broadening participation of underrepresented groups in science, engineering, and mathematics (SEM). The Division operates and coordinates a range of programs that focus on increasing the presence of minorities, women and girls, and persons with disabilities in SEM.

Alliances for Minority Participation

The Alliance for Minority Participation (AMP) program at NSF is a comprehensive and multidisciplinary undergraduate program designed to significantly increase both the quality and the number of baccalaureate degrees in science, engineering, and mathematics (SEM) earned by groups who are underrepresented in SEM. AMP supports alliances via cooperative agreements that contain each alliance's goal (the current number of minorities obtaining BS degrees in SEM and the alliance's five year goal) and specific work statements that describe how the alliance will achieve its goal. AMP institutions are committed to better serve all SEM students today and to institutionalize changes that will ensure that all students have access to quality SEM educational opportunities.

Alliances establish partnerships among community and other two-year colleges, four-year colleges and universities, school systems, other government agencies, major National SEM laboratories and centers, industry, private foundations, and SEM professional organizations as

necessary to achieve AMP objectives. Two-year colleges are involved in virtually every AMP project in significant ways.

For example, 18 of the 20 campuses of the California State University (CSU) system are each paired with a feeder two-year college member of the state community college system. The heart of the alliance program is a sequence of supplemental workshops to which a group of minority students are asked to make a commitment. In the summer before their freshman year students take a four-week summer workshop focusing on entry level mathematics courses followed by a year long workshop which parallels and supplements the students' freshman year courses in mathematics. In the second year, students attend another four week summer workshop which focuses on physics, chemistry, or biology combined with appropriate mathematics. This second workshop is followed by a year long workshop focusing on science. All workshops are located on one of the CSU campuses, but academic year activities take place at both the CSU campuses and the community college locations.

The New York City Alliance is a coalition of 16 colleges within the City University of New York (CUNY) who share a five-year goal of doubling the number of underrepresented minority students earning degrees in science, engineering, and mathematics. The coalition includes 7 community colleges, 8 senior colleges, and 1 technical college. The project is leading a change in the teaching of mathematics and science, especially at the introductory level. The new approach emphasizes problem-solving and collaborative learning. Alliance initiatives are improving the articulation between community and senior colleges. One of the four project directors is from Bronx Community College.

The Texas AMP, lead by Texas A & M, helps remove obstructions that minority students face at four-year institutions and creates a pipeline between community colleges and four-year institutions. Active and lead AMP institutions includes 5 four-year institutions and 9 community colleges. Community college students are also recruited for industry internships so that all students can benefit from the experience. Two activities which specifically promote the pipeline between community colleges and four-year institutions are the Trans-Texas Videoconference Network and the Office of Transfer and Articulations.

A newly formed Alliance is the All-Nations Alliance for American Indians which is developing and implementing innovative programs with input from both the Indian community and the SEM community to enhance matriculation of American Indians at three critical transition points two of which involve community colleges: (1) high school to college (tribal/community/four-year), (2) two-year college (tribal/community) to four-year, and (3) four-year institutions to doctoral-granting programs in SEM fields. The two lead institutions are Salish Kootenai College (SKC), a tribal college, and Montana State University, a SEM baccalaureate and doctoral degree granting college.

Data from 7 of the 20 AMP projects which are currently being supported is given in Table 10 as a measure of partial impact of the AMP program on community colleges.

Table 10

Community College Involvement in AMP Projects
Number of Community Colleges and
Total Community College Enrollment Per Alliance
7/20 AMPS Reporting
FY92-94

Alliance	1992	1993	1994
Arizona			
Community Colleges	11	20	18
CC Enrollment	159,551	146,034	109,737
Florida/Georgia			
Community Colleges	n/a *	3	3
CC Enrollment	n/a*	66,363	80,039
New Mexico			
Community Colleges	n/a *	n/a	14
CC Enrollment	n/a *	n/a	37,100
New York			
Community Colleges	n/a *	6	6
CC Enrollment	n/a *	58,072	59,791
South Carolina			
Community Colleges	n/a *	1	1
CC Enrollment	n/a *	12,206	16,394
Texas A & M			
Community Colleges	3	9	n/r Ψ
CC Enrollment	8,532	26,063	n/r Ψ
University of Texas			
Community Colleges	n/a *	6	3
CC Enrollment	n/a *	132,811	31,884
Totals			
Community Colleges	14	45	45
CC Enrollment	168,083	441,549	334,945

* n/a -- Alliance was initially funded in a later year.
Ψ n/r -- information not received

Other HRD Support

In addition to the AMP program, HRD directly supported two-year colleges through the Summer Science Camps Program and the Program for Persons with Disabilities. Seattle Central Community College in cooperation with the Seattle School District and Seattle businesses is implementing a **Summer Science Camp Program** for underrepresented middle school students entitled *The Biosphere of Tomorrow*. Activities are designed to increase awareness of the region's environment and how urbanization has affected the water quality of Pugent Sound.

Linn Benton Community College is being supported under the **Program for Persons with Disabilities** to review and compare present technologies used in Europe and the United States to improve access to education by students with visual, hearing, motor, and learning disabilities. Research will be used in formulation of a SEM program at Oregon State University for education of students with disabilities.

Other EHR Support

Two-year colleges are also receiving support through the Office of Systemic Reform (OSR) and the Division of Research, Evaluation, and Dissemination (RED).

Indian River Community College, supported through the **Studies Program** in RED, is examining the competencies needed by people entering technology-based industries and mapping those skills with relevant two-year curricula.

The Office of Systemic Reform (OSR) supports the state systemic initiatives, the urban systemic initiatives, and the rural systemic initiatives. Community colleges are involved as appropriate in numerous of the state and urban systemic initiatives; however, the focus of these programs is to improve science, mathematics, engineering, and technology education for grades pre-K through 12. The Rural Systemic Initiative (RSI) involves community colleges in more substantive ways. Activities to date for that program are reported below.

Rural Systemic Initiatives

The goal of the Rural Systemic Initiatives (RSI) is to promote systemic improvements in science, mathematics, and technology education for students in rural, economically disadvantaged regions of the Nation, particularly those that have been underserved in NSF programs, and to ensure sustainability of these improvements by encouraging community development in conjunction with instructional and policy reform. In addition, programs should help prepare a technologically competent workforce to enhance the infrastructure of economic development activities within a

community or region by strengthening the science, mathematics, and technology instructional capacities of regional colleges and universities, particularly community and technical colleges responsible for technician education. Programs also strengthen other lower division instruction of technical curricula and entry-level science and mathematics curricula of the future teaching workforce.

In FY94, the RSI Program made 4 development awards (average award size $250,000) and 2 planning grants (approximately $60,000 each). These collaborations extend across K-12 school systems and into institutions of higher education resulting in the meaningful alignment of funding, curriculum, instruction, assessment, teacher preparation, and guidance systems. All consortia include two-year colleges or institutions which offer associate degree programs.

For example, Turtle Mountain Community College is leading **the High Plains Rural Systemic Initiative** which brings together 17 American Indian Tribal colleges and other institutions, agencies, and businesses involved in science, mathematics, engineering, and technical (SMET) education in North Dakota, South Dakota, Nebraska, Wyoming, and Montana. This initiative is seeking to identify and coordinate efforts to remove impediments for exemplary student performance in SMET education among American Indians.

As another example, the **Appalachia Rural Systemic Initiative** is a collaborative effort among the states of Kentucky, West Virginia, North Carolina, Virginia, Tennessee, and Ohio comprising the central Appalachian region. The coalition is directing, facilitating, and organizing a series of activities designed to determine needs and strategies for systemic educational reform in a geographically challenged and economically depressed area. Study groups, all of which include two-year college representatives, are bringing the concept of systemic reform to isolated school districts while gathering information, identifying resources which exist and those which are needed, and developing recommendations for systemic reform of science and mathematics education throughout the region.

LEVERAGED PROGRAM SUPPORT: RESEARCH DIRECTORATES

NSFNET

NSFNET encourages and facilitates scholarly communication and collaboration by providing data network access to researchers and educators, supercomputer centers, and information resources. NFSNET supports expansion, operation, and use of the NSFNET backbone service and assists mid-level networks, and supports network connections from institutions of higher education to mid-level networks. In FY94, NSFNET supported direct access for 26 two-year colleges for connections to the Internet. Other two-year colleges were supported through larger grants which have helped consortia of institutions gain access to internet capabilities. More than 200 two-year colleges are now being connected to the internet through statewide consortia (e.g., in North Carolina through NCREN, in Kansas through KANnet, and in Georgia through PEACHnet.)

For example, Clackamas Community College in Oregon is benefiting from access to resources of the internet including libraries and supercomputers. Faculty and students can communicate and collaborate with colleagues at other institutions in pursuit of educational and research opportunities. NSFNET is also supporting Chesapeake College in Maryland to connect to SURAnet, the mid-level network located in the southeastern United States. By linking to the mid-level network, faculty and students can explore innovative educational resources including databases, information services, high speed communications, file transfers, and library resources. Fond du Lac Community College is the first Minnesota Community College system campus to join MRNet and one of the first American Indian Higher Education Consortium (AIHEC) members to offer Internet services on campus. Fond du Lac Community College is planning to be in a position to offer leadership and technical assistance to other AIHEC institutions.

Other Selected Examples

Fond du Lac Community College has a **Computer and Information Science and Engineering Institutional Infrastructure** award to increase the number of American Indian students attaining four-year and graduate degrees in computer science and engineering. This model is increasing interest in computer science and engineering among American Indian youth, supporting the bridge between the K-12 schools to the tribal college, strongly supporting students in lower division computer science and engineering courses, and supporting students as they

transfer from the tribal college to four-year computer science programs. It is designed to be attractive and applicable to tribal K-12 schools and colleges governed by sovereign tribal nations which are key providers for American Indian youth living on or near tribal lands.

A faculty member at Allegany Community College has been awarded **a Research at Undergraduate Institutions (RUI)** to study *TY Insertional Mutagenesis in Yeast*. The goals of the project are to increase the general utility of insertional mutagenesis using inducible TY elements in budding yeast and to gain a better understanding of mechanism of gene disruption by TY. The investigator, a professor at a rural community college, is involving her students in this research, thus raising their scientific literacy and possibly inspiring future research careers.

Faculty members at Butte College through the **Biotic Surveys and Inventory** program are mapping, photographing, and digitizing the fossil dinosaur quarry at Dinosaur National Monument as well as quarry maps of the original rock face which no longer exists. This project is new to paleontology and has the possibility to revolutionize the science by combining traditional approaches with emerging technologies in surveying, photogrammetry, computer-aided mapping, and advanced database design. It also has the potential to be used in informal science programs and classroom instruction.

A faculty member at Massachusetts Bay Community College through the **Metabolic Biochemistry** program is researching the complex mechanism which operates in mammalian systems to control prostaglandin formation. Prostaglandins are so called local hormones which are produced quickly in local tissue cells as a result of corporal stress such as temperature changes, fatigue, or wounding. This research is designed to help in understanding of how the mammalian body controls its temperature and combats fatigue, how fat is formed and used, and how tissue becomes inflamed and irritated.

Technology Reinvestment Project (TRP)

The mission of the Technology Reinvestment Project (TRP) is to stimulate the transition to a growing, integrated, national industrial capability that provides the most advanced, affordable, military systems and the most competitive commercial products. The TRP encourages and pursues its goal of industrial base integration through competitively selected technology proposals. The unifying theme of all funded activities is that investments in dual-use technology development, deployment, and education will offer significant advantages to the military security of the nation and lead to flexibility, affordability, and competitiveness for U. S. firms internationally.

The TRP is divided into four related Competition Areas: Technology Development to promote the development of dual-use technologies; Regional Technology Alliances to enhance regional industrial capabilities that are important to national security; Manufacturing Education and Training to establish programs for the retraining of Defense workers and improvement of the manufacturing curriculum in U. S. colleges and universities; and Small Business Innovation Research to encourage scientific and technical innovations by small businesses.

Two-year colleges were supported in most of the areas either directly or as part of consortia activities. Most of the direct support however was through the Manufacturing Education and Training (MET) area which is administered through NSF.

Manufacturing covers a wide range of technologies and concepts, and encompasses the full spectrum of materials, products, and processes upon which the American industrial enterprise is based. In the context of the Manufacturing Education and Training (MET) competition, manufacturing includes the full range of economic activities from chemical and biotechnology processing to electronic component and system fabrication, durable goods production, fabrication of structures, and other manufacturing sectors.

Activities in the MET area focus on upgrading individual skills with the aim of producing a world-class, flexible manufacturing workforce that will function effectively under both Defense and commercial production regimes. They also focus on providing the highly-skilled, flexible, technical workforce of the future.

TRP/MET activities provide Defense and commercial engineers and technicians with improved knowledge of manufacturing engineering, science, and mathematics so they may more effectively contribute to the global competitiveness of the United States industry. Emphasis is on dual-use manufacturing engineering skills and business knowledge. Activities target the improvement of curriculum and educational tools at universities, two- and four-colleges,

technical and vocational schools, and pre-college educational institutions, and emphasize partnerships among these educational institutions. Activities place special emphasis on skill conversion for engineers, technicians, and other professionals displaced by the Defense draw-down.

In FY94, six two-year institutions were directly supported by TRP/MET awards. Four of these have NSF proposal numbers and were included in the summary of awards at the beginning of this document. Five additional awards have two-year college co-principal investigators and significantly involve two-year colleges in project activities.

Table 11

Technology Reinvestment Project/
Manufacturing Education and Training Awards
FY94

Type of Institutions	# of Awards	FY94 Dollars
Two-Year College Grantees/NSF Awards	4	$1,751,471
Two-Year College Grantees/NASA Awards	2	650,708
Four-Year Institutions with Two-Year College Co-Principal Investigators NSF Awards	4	2,399,003
Totals	10 Ψ	$4,801,182 * Ψ

Ψ In Table 1 in the front of this document, only the 8 awards with NSF numbers are included. Dollars reported in Table 1 is the total of two-year college grantees with NSF award numbers and 25% of the dollars to four-year institutions with two-year college co-principal investigators.

* Dollars reported are FY94 only. Total funding including out-year commitments is $8.4 million.

NOTES ON SOURCE OF DATA

The data provided in Tables 1,2,3,4,9, and 11 came from the NSF Main Database. It was verified whereas possible by reading abstracts. In a few cases, dollars on awards are included when it was known that institutions were not coded as two-year institutions in the main database but are two-year institutions (e.g., South Seattle Community College). Data from Table 5 was supplied by reading the abstracts from the Advanced Technological Education (ATE) program and verified by the ATE principal investigators. Data in Table 6 came from the Division of Undergraduate Education Instrumentation and Laboratory Improvement program records. Data in Table 7 came from reading the abstracts in the Undergraduate Faculty Enhancement program and verified with DUE program directors. Data in Table 8 came from information provided by the principal investigators of Undergraduate Faculty Enhancement projects. Data in Table 10 was provided by HRD and is self-reported data from AMP projects.

Summaries include awards where either the principal investigator or a co-principal investigator was from a two-year college. The only exceptions to this are two of the Alliances for Minority Participation (AMP), one State Systemic Initiative (SSI), and one Urban Systemic Initiative (USI). It is difficult to determine the direct benefit to two-year colleges through these programs, although it is recognized that the benefit is substantial. Because the awards in these programs are very large, it was determined that including those amounts would skew the data. A conservative estimate is that 10 to 25% of those projects directly benefit two-year colleges. In addition, conservatively, it is also estimated that most of the other AMP, SSI, and USI projects also provide 1% to 25% direct benefit to two-year colleges.

This report was prepared by the Division of Undergraduate Education. While every effort was made to secure information from other sources, some information may be missing. In addition, programs officers in ESIE, HRD, Engineering, CISE, and OSR reviewed the information provided in this report.

Appendix I

Advanced Technological Education
Report from Leadership Workshop

The National Science Foundation (NSF) and the American Association of Community Colleges (AACC) held a two and one-half day conference for the Advanced Technological Education (ATE) principal investigators on October 27, 1994. An ATE Leadership Workshop preceded the first Principal Investigator's Conference. The Leadership Workshop involved education leaders from two- and four-year colleges, universities, and secondary schools; leaders from industry with interest in technical education; and representative from professional societies. The Principal Investigator's Conference which followed involved the 3 newly awarded ATE Centers, the 16 ATE planning grants for Centers, and 6 of the large curriculum development projects.

A primary purpose of the workshop and the conference was to focus on some critical issues related to the ATE program such as industry's expectations from technicians educated through ATE projects and centers, future directions for the ATE program, and mechanisms for a coordinated approach to the activities undertaken by the grant recipients for the centers and various projects.

The opinions expressed in this appendix are those of workshop participants and do not necessarily reflect NSF policy. The recommendations are under review at NSF.

Current Status of Technical Jobs

In industry today, the positions and roles of engineers, technologists, and technicians are changing rapidly. Technician positions are evolving into what are currently engineering jobs and responsibilities, and engineering jobs are evolving into something else. Technicians now require more advanced technical skills as well as more mathematics, science, and technology backgrounds. Today's workforce must be technically well prepared to both participate and lead in the high performance workplace of advanced technologies.

Workshop participants believe that currently there are many pathways to becoming a technician in industry; technicians come with a wide variety of preparation. Many technical staff in industry hold a BS degree in science or engineering; however, many of those jobs could be done by a well qualified two-year science or engineering technology graduate.

One problem that the Leadership Conference participants identified was the lack of a common definition or set of standards for the term "technician." According to participants, the United States is the only industrialized nation without a formal system for the development and

dissemination of workforce skill standards. "Technician" has not been defined in the way occupational titles such as "engineer", "nurse", "lawyer", etc. have been defined by the society. No clear understanding of the skills and performance expectations from individuals functioning as "technicians" exists. While Voluntary Industry Standards are being developed for 23 technical jobs including manufacturing, chemical technology, environmental technology, and biotechnology, the ultimate impact of these standards is yet to be determined. In addition, there are many technical jobs which do not fall into one of the 23 categories and some of these standards are not intended to be for advanced science or engineering technicians, but are more skill oriented.

Employer representatives at the Leadership Conference predicted that in the future employees will not necessarily have lifetime job security. Industry must respond to its environment and cannot control all circumstances. Some employees will be regarded by employers as essential and will be treated as investments, these technicians will be retrained or reeducated as requirements change. Other employees will be temporary, and hired or laid-off as needs dictate. Many jobs we now identify in industry will disappear, particularly at the engineering levels; however, the expectation is that technician level jobs will increase in number and importance.

Some industry representatives reported that employers are more willing to hire recent graduates rather than experienced workers because they had not yet developed bad work habits. However, research findings reveal that most employers prefer to hire people with prior industrial experience because they had demonstrable skills and a proven track record as employees.

Observations & Recommendations

During the course of the two and one-half days, discussions were held on the status of technical jobs in the U.S., roles of industry, colleges, and secondary schools in technician education, and the future direction for the ATE program. Questions, observations, and recommendations related to the three main themes discussed at the Leadership Workshop and Principal Investigators Conference are summarized below:

***Issue 1: <u>Technical Jobs</u>* - What is the role of engineers and technicians in U.S. industry today? What role is industry playing in improving technician job opportunities, education, and status? What are the skills expectations and educational needs for tomorrow's technicians?**

- Two-year colleges should be more active in promoting the value of the associate degree. An associate degree in a technical field should guarantee specific minimum levels of science and mathematics background, technical and workplace skills, and performance expectations. Employers should emphasize and support associate degree education for their technician level employees.

- Technicians of tomorrow will not only manage and operate technical machinery and systems, but will also make operational decisions in such areas as inventory and safety management, and quality control. There will be a convergence of today's so-called white and blue collar jobs to a new and expanded job category called "technical associates". These "technical associates" will be expected to be two-year college technical degree graduates. With new expectations and demands placed on these technicians, they will need to have a broad based technical and management related education. Academic programs suitable to prepare these graduates will consist of general education requirements combined with the state-of-the art technical content.

- With the increasing level of technical sophistication and job responsibilities, importance of science and engineering technicians will grow as well. However, in order to attract good students to very high paying, highly skilled technical jobs, the public image of a technician must improve. Job classification of technicians must gain a certain level of societal respect.

- Lifelong learning will become more important. Industry must provide periodic education and training programs to upgrade skills and knowledge of their permanent employees. Employees need new skills to move from job to job. In order to accommodate the workforce, education and training programs must be made available as employees make the transition from one type of employment to another.

- Contrary to recent trends, industry may not continue to provide technical education in-house. Therefore, technicians graduating in the next few years will get good technical jobs if they are properly educated. If there is a reduction in the engineering workforce, those positions will be filled by well qualified two-year technicians.

Issue 2: ***Educational Programs*** **- What is the role of education and industry in providing for changing workplace needs? What resources must be provided for continually updating employee and faculty skills? How can the education assure an appropriate level of science, mathematics, and technology for technical programs?**

- Because of the expanded role of technicians, academic programs designed for technician education will become more sophisticated. Technicians will not only need a higher level of technical knowledge, but also improved analytical and communications skills.

- Industry should expand its relations with educational institutions. Industry should continue and, where necessary, expand educational reimbursement programs. Industry must provide opportunities for internships to college and secondary school students.

- College faculty must use summer months for "return to industry" type of professional

development activity to maintain currency in the state-of-the art technology in use in industry, and industry should provide such opportunities for faculty. Similar opportunities must be provided for high school teachers as well.

- Tech-Prep type of secondary school programs are very effective means for developing student interest in technical careers. In order to keep up with the changing technologies, today's technician will be expected to be self-motivated and life-long learners. Therefore, along with the technical content, "tech-prep" type of curricula should also provide strong foundation and understanding of relevant mathematics and sciences.

- Secondary schools must reinforce the need for science, mathematics, engineering, and technology education for all students. Like the "college-prep" program of today, "tech-prep" programs must also prepare students for advancement to college level education. Schools must avoid putting students into "tracks", and develop programs that provide greater flexibility for entry and exit across these programs.

- Secondary schools and two-year colleges must work together to provide information about the importance of technical education and educational opportunities at two-year colleges; industry can be a valuable partner in this endeavor.

- Instructional techniques, both at secondary schools and colleges, should foster the development of workplace skills, such as communications, critical thinking, problem solving, computer applications, analytical capabilities, team work, environmental concerns, and work ethics.

Issue 3: ATE Program - **How can the ATE program have a national impact on technological education to serve industry needs? How can industry, educational institutions, and NSF work together to maximize the impact of the ATE program?**

- ATE centers should function as "models". ATE projects should develop quality educational programs to prepare quality graduates. The graduates must be ready to move into today's job market, flexible enough to train themselves for new technology at their present workplace, or in new jobs. ATE programs should provide broad based technical and life-skills based education, and not just hands-on skills training program. Skills programs require employees to be retrained every time a new system or process is brought into the workplace.

- Institutions and departments involved in ATE projects and centers must learn from each other's experiences and adopt and adapt their work when appropriate. This can be accomplished only if the principal investigators involved in various ATE projects and centers communicate, both formally and informally, with each other on a routine basis. In order to facilitate such communications, a mechanism should be established to act as the conduit for on-going communications. For example, a quarterly newsletter and Internet communications

system for disseminating ATE related activities could be developed.

- ATE centers must collaborate with each other so that they complement each other's activities. Centers should establish linkages among groups working on similar projects. The role of centers should be to create space in which models are tested in a broader way. Centers could also provide peer review and support to individual projects.

- Because of industry's preference for an experienced workforce, ATE programs should promote internship, cooperative work experience, and summer employment types of educational programs. Because there may not be sufficient slots for industrial experience for all students, ATE developed educational programs and courses must emphasize "real-world" and project-oriented content, and cooperative learning and teamwork rather than competitive and individualistic learning.

Concluding Comments

In order to remain competitive in the world market, American industry is faced with cutting costs while simultaneously improving the quality of its products and services. To accomplish this challenge, industry needs to focus continually on quality improvement and needs a higher quality work force, one that is more highly skilled and more motivated. Employees of the future have to be more flexible in order to adapt to rapidly changing technology. The success of efforts to improve the American workforce depend upon the strength of partnerships that must form between industry and all levels of education. Two-year colleges are essential to the preparation of the nation's technical work force. However, the strong commitment of industry representatives and educators at the secondary and four-year college and university levels is also required.

Leadership Conference participants expressed their belief that the ATE program, initiated by the National Science Foundation, acting through two-year colleges, four-year colleges and universities, secondary schools, and businesses, is addressing this important issue. The ATE program has the potential for making a significant difference both for the preparation and development of technical employees and for the future of our nation.

Appendix II

History of the ATE Program: Important Dates

December, 1992	Science and Advanced Technology Act (SATA) passes Congress and signed by president which authorizes NSF to create the ATE program
Spring, 1993	NSF prepares preliminary plans for ATE NSF preliminary Outreach to community on ATE
Summer, 1993	ATE program preparation
July 21 - 23, 1993	NSF in cooperation with the American Chemical Society (ACS) and the Federal Coordinating Council for Science, Engineering, and Technology (FCCSET) hosts a national workshop on critical issues in science and engineering technician education
August 12, 1993	ATE program receives National Science Board (NSB) approval
August 23, 1993	ATE program announcement appears on STIS and in the Federal Register
September 8, 1993	ATE program announcement (NSF 93-132) mailed
November 1, 1993	Preliminary Proposals and Planning Grants 1 due
December 2-3, 1993	ATE Preliminary Proposal Review Panels for FY94
Late Dec., 1993 - Early Jan., 1994	Responses to Preliminary Proposals Mailed
January - March, 1994	Six ATE planning grants awarded
March 22, 1994	First Formal ATE proposals deadline
April, 1994	Press Release on first ATE planning grant awards
May 12 - 14, 1994	ATE panel review for formal proposals
May, 1994	Workshop report ***Gaining the Competitive Edge: Critical Issues in Science and Engineering Technician Education***(NSF 94-32) publication becomes available and is mailed to community

Spring, Summer, Fall 1994	Outreach workshops on ATE sponsored with the American Association of Community Colleges (AACC) and various professional societies
June, 1994	Site visits to highly competitive center proposals
Summer, 1994	Awards for 3 Centers, 10 more planning grants for Centers, and 39 projects negotiated
July, 1994	Publication *Activities in Support of Two-Year College Science, Engineering, Technology, and Mathematics Education: Fiscal Year 1993 Highlights* (NSF 94-86) becomes available and is mailed to community
July 28, 1994	Preliminary proposals for FY95 ATE program due
Aug., Sept. 1994	Awards for the ATE projects, centers, and planning grants made
Sept. 23-24, 1994	Panel for FY95 ATE Preliminary Proposals
Oct. 27 - 29, 1994	ATE Principal Investigators Conference for Centers, Planning Grants for Centers, and selected large projects plus a Preconference Leadership workshop involving industrial and educational leaders
Oct., 1994	Responses to FY95 preliminary proposals sent
Jan. 26, 1995	Formal ATE proposals for FY95 due
March 16-18, 1995	Review Panel for FY95 ATE formal proposals
August 3, 1995	Preliminary ATE Proposals for FY96 due
February 1, 1996	Formal ATE proposals for FY96 due

Appendix III
National Science Foundation
FY94 Awards to Two-Year Colleges
Two-Year College Principal Investigator or Co-Principal Investigator

The awards in this appendix are ordered alphabetically by state, then by Division, by program within the division that made the award, and lastly, by proposal number. This list does not include the four grants made to two-year colleges for IPA positions. The Technology Reinvestment Program (TRP) awards are listed at the end of this document.

The following acronyms identify the Divisions with awards in this list:

AST	Division of Astronomical Sciences
BES	Division of Bioengineering and Environmental Systems
BIR	Division of Biological Instrumentation and Resources
CDA	Office of Cross-Disciplinary Activities
CHE	Division of Chemistry
DEB	Division of Environmental Biology
DMI	Division of Design, Manufacturing and Industrial Innovation
DMS	Division of Mathematical Sciences
DUE	Division of Undergraduate Education
ECS	Division of Electrical and Communications Systems
EEC	Division of Engineering, Education and Centers
ESI	Division of Elementary, Secondary and Informal Education
EW	Joint National Science Foundation/National Endowment for Humanities
GER	Division of Graduate Education and Research Development
HRD	Division of Human Resource Development
IBN	Division of Integrative Biology and Neuroscience
MCB	Division of Molecular and Cellular Biosciences
NCR	Division of Networking and Communications Research and Infrastructure
OSR	Office of Systemic Reform
RED	Division of Research, Evaluation and Dissemination
IMD	Instructional Materials Development

The awards appear in the following format:

Division Acronym-Proposal #
Project Title

PI: Principal Investigator — 1994 Dollars (Total Award Dollars)
Awardee Institution — City, State, Zip Code

NSF Program under which the proposal was submitted

CoPI: CoPrincipal Investigator: CoPI's Institution
or In Partnership With : A Partner Institution
THIS LIST DOES NOT INCLUDE CO-PRINCIPAL INVESTIGATORS WHEN FROM THE SAME INSTITUTION AS THE PI.

BEST COPY AVAILABLE

ARIZONA

DUE-9454520
Image Processing for Teaching: Faculty Development and Curriculum Materials
PI: Melanie Magisos — $403,814 ($1,346,831)
Center for Image Processing — Tucson, AZ 85712-3657
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
In Partnership With : Pima Community College

DUE-9454545
Maricopa Advanced Technology Education Center (MATEC)
PI: Alfredo de los Santos — $49,993 ($49,993)
Maricopa County Community College District — Tempe, AZ 85281-6941
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM

DUE-9254228
Computer Applications to Enhance Inquiry-Oriented Laboratory Instruction in Biology at a 2-Year College
PI: William Kincaid — $82,125 ($297,482)
Mesa Community College — Tempe, AZ 85281-6941
DUE COURSE & CURRICULUM PROGRAM

DUE-9450921
Instrumentation and Laboratory Improvement Program
PI: Dennis Shaw — $39,227 ($39,227)
Maricopa Technical Community College — Phoenix, AZ 85034-1704
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT
CoPI: John Arle : Rio Salado Community College

CALIFORNIA

DEB-9320133
SGER: Quarry Database Project
PI: Geoffrey Fricker — $50,000 ($50,000)
Butte College — Oroville, CA 95965-9801
LONG-TERM PROJECTS IN ENVIRONMENTAL BIOLOGY
CoPI: Anthony Fiorillo : University of California Berkeley
CoPI: John McIntosh : Wesleyan University

DUE-9454502
Expanding the Biotechnology Education Program in the San Francisco/Oakland Bay Area
PI: David Stronck — $250,000 ($250,000)
California State University - Hayward Foundation — Hayward, CA 94542-1602
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
CoPI: Mabel Hom : Contra Costa Community College

DUE-9454512
Planning Grant for an Advanced Biotechnology Education Center
PI: Leslie Snider — $48,206 ($48,206)
MiraCosta College — Oceanside, CA 92056-3820
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
CoPI: Kay Pauling : Foothill College
CoPI: David Singer : San Diego City College
CoPI: Robert Price : City College of San Francisco

DUE-9454513
Pac-TEC--"The Pacific Technological Education Center
PI: Charlotte Behm — $300,000 ($300,000)
Mission College — Saratoga, CA 95070
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
CoPI: Wade Ellis : West Valley College

DUE-9454521
Preserving the Legacy: A Comprehensive Curriculum and Materials Development Project in Support of Advanced Environmental Technology Education
PI: Sally Beaty — $499,988 ($1,499,966)
Intelecom — Pasadena, CA 91101-2437
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM

DUE-9454567
MATE - Monterey Advanced Technology Education - Center - Planning Grant
PI: Kam Matray — $50,000 ($50,000)
Monterey Peninsula Unified School District — Monterey, CA 93942-1031
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
CoPI: Steven Webster : Monterey Peninsula College

DUE-9454657
Advanced Technological Education in Biotechnology: A Community College--Industry Partnership
PI: Jamie Deneris — $209,074 ($209,074)
Peralta Community College District Office — Oakland, CA 94606-2844
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM

DUE-9354531
Interactive Computer Visualization in the Introductory Science Curriculum
PI: Victoria Bragin — $98,679 ($98,679)
Pasadena City College — Pasadena, CA 91106-2003
DUE COURSE & CURRICULUM PROGRAM

DUE-9450735
Instituting Calculus Reform: A Community College - State University Consortium Model
PI: William Lepowsky $119,703 ($119,703)
Peralta Community College District Office Oakland, CA 94606-2844
DUE COURSE & CURRICULUM PROGRAM

DUE-9353947
Modern Chemistry Tools: Theory, Practice, and General Chemistry Experiments
PI: Arlene Russell $58,750 ($58,750)
University of California Los Angeles Los Angeles, CA 90024-1301
UNDERGRADUATE FACULTY ENHANCEMENT PROGRAM

DUE-9353952
CSUPERB Undergraduate Faculty Enhancement Program in Biotechnology for Two- and Four-Year College Teachers
PI: Crellin Pauling $319,988 ($319,988)
San Francisco State University San Francisco, CA 94132-1722
UNDERGRADUATE FACULTY ENHANCEMENT PROGRAM
CoPI: Henry Schott : Vista College

DUE-9451326
Computer Classroom in Calculus
PI: Thomas McCutcheon $49,435 ($49,435)
Los Angeles Pierce College Woodland Hills, CA 91371
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

DUE-9451439
Approved Marine Biology Laboratory Curriculum
PI: Thomas B. O'Neill $8626 ($8626)
Ventura College Ventura, CA 93003-2037
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

DUE-9451774
Video and Digital Image Processing for Physics Laboratory Instruction
PI: Douglas Brown $36,184 ($36,184)
Cabrillo College Aptos, CA 95003-3119
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

DUE-9452372
Networking, Unix, and Graphics Laboratory
PI: John Perry $95,342 ($95,342)
Foothill College Los Altos Hills, CA 94022-4504
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT
CoPI: Beverly D'Urso : De Anza College

DUE-9452508
Mathematics Videodisc Laboratory Project
PI: Robert Curtis $21,690 ($21,690)
San Joaquin Delta College Stockton, CA 95207-6304
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

DUE-9452617
Microcomputer-Based Laboratories in a Linked Physics-Calculus Program
PI: Oshri Karmon $21,126 ($21,126)
Diablo Valley College Pleasant Hill, CA 94523-1529
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

ESI-9440197
Jaime Escalante Math and Science Program
PI: George Madrid $6,621 ($6,621)
East Los Angeles College Monterey Park, CA 91754-6001
TEACHER ENHANCEMENT PROGRAM

IBN-9206441
RUI: Control of Ventilation and Acid-Base State in Heterothermic Mammals
PI: Joseph Szewczak $18,054 ($103,287)
Deep Springs College Deepsprings, CA 93513
PHYSIOLOGY AND BEHAVIOR PROGRAM

NCR-9318953
Connection to the Internet
PI: David Bell $27,644 ($27,644)
Riverside Community College District Riverside, CA 92506-1242
NETWORK INFRASTRUCTURE

NCR-9412999
Mendocino College NSFNET Connection
PI: Stan Malley $18,583 ($18,583)
Mendocino College Ukiah, CA 95482
NETWORK INFRASTRUCTURE

COLORADO

DUE-9454633
Environmental Technology Education Transfer to Native American Tribal Colleges
PI: Karl Topper $399,778 ($399,778)
Mesa State College Grand Junction, CO 815022647
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
In Partnership With : Navajo Community College
In Partnership With : Northern New Mexico Community College

CONNECTICUT

DUE-9353938
Integrating the First Two Years of Mathematics at Two and Four Year Colleges
PI: John Williams $200,000 ($200,000)
University of Hartford West Hartford, CT 06117
UNDERGRADUATE FACULTY ENHANCEMENT PROGRAM
In partnership with: Manchester Community College, Greater Hartford Community College, New Haven Technical College, Middlesex Community College, Salve Regina College

DISTRICT OF COLUMBIA -- WASHINGTON, DC

CDA-9414221
Special Project: Assisting Institutions of the American Indian Higher Education Consortium to Compete for Research and Education Funding Opportunities
PI: Annzell Loufas, D-Q University, Davis, CA $34,100 ($34,100)
American Indian Higher Education Consortium Washington, DC 20002-4937
OFFICE OF CROSS-DISCIPLINARY ACTIVITIES

DUE-9154055
Faculty Enhancement Institute
PI: Lynn Barnett $19,000 ($878,000)
American Association of Community Colleges Washington, DC 20036-1110
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM

DUE-9454564
Science Technology: Knowledge and Skills
PI: David Lavallee $500,000 ($1,500,000)
American Chemical Society Washington, DC 20036-4800
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
In Partnership With : Rhode Island Community College

DUE-9255447
Statistical Thinking and Teaching Techniques
PI: George Cobb $150,717 ($450,068)
Math Association of America Washington, DC 20036-1358
UNDERGRADUATE FACULTY ENHANCEMENT PROGRAM
CoPI: Mary Parker : Austin Community College, Austin, Texas

FLORIDA

DUE-9454637
National Center for Excellence in Advanced Technological Education Presented by Community College for Innovative Technology Transfer (CCITT)
PI: Maxwell King — $50,000 ($50,000)
Brevard Community College — Cocoa, FL 32922-6503
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
CoPI: Dennis Bartow : Prince George's Community College, MD
CoPI: Gary Green : John C. Calhoun State Community College, AL
CoPI: Michael Quanty, Thomas Nelson Community College, VA
CoPI: Curtis Gooden: Cuyahoga Community College, OH
CoPI: Barton Sipofsky: Brevard Community College, FL

DUE-9450744
Calculus and the Bridge to Calculus
PI: W. Frank Ward — $100,000 ($100,000)
Indian River Community College — Fort Pierce, FL 34981-5541
DUE COURSE & CURRICULUM PROGRAM

DUE-9451023
Computer Assisted Calculus: Using Technology to Promote Active Learning in the Community College
PI: Ann Steen — $54,073 ($54,073)
Santa Fe Community College — Gainesville, FL 32606-6210
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

DUE-9452238
Using Techniques of Molecular Biology to Improve Skills and Attitudes of Students in Biological Science Courses
PI: John Chapin — $18,034 ($18,034)
St Petersburg Jr. College — Saint Petersburg, FL 33733-3489
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

NCR-9413330
Connecting FCCJ to NSFNET
PI: Jack Tinsley, Jr. — $25,000 ($25,000)
Florida Community College - Jacksonville — Jacksonville, FL 32202-4030
NETWORK INFRASTRUCTURE

RED-9355757
A Comparison of the Common Core of Science, Math and Engineering, Competencies Required for Employment in Technology Based Business and Industry
PI: Jeanne Diesen — $48,060 ($48,060)
Indian River Community College — Fort Pierce, FL 34981-5541
RESEARCH SECTION

GEORGIA

DUE-9450973
Computer Graphics as a Tool for Teaching Chemical Structure and Bonding in the Two-Year College
PI: Michael Denniston $18,904 ($18,904)
DeKalb College Clarkston, GA 30021
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

DUE-9452006
The Cooperative Laboratory in Biotechnology
PI: Gregory Hampikian $27,121 ($27,121)
Clayton State College Morrow, GA 30260-1250
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

ESI-9353886
Science and Mathematics are Right Together (SMART)
PI: John Morrell $46,133 ($93,969)
Atlanta Metropolitan College Atlanta, GA 30310-4448
YOUNG SCHOLARS PROGRAM

HAWAII

AST-9319039
A Medium Resolution Spectrograph for the NASA Infrared Telescope Facility
PI: John Rayner $219,994 ($1,100,053)
University of Hawaii Manoa Honolulu, HI 96822-2225
OPTICAL AND INFRARED FACILITIES UNIT
CoPI: Dale Cruikshank : University of Hawaii Honolulu Community College

DUE-9454647
Establishing and Transporting Science, Computer, and Electronics Technology Curricula to Rural Minority Students through Simulated Labs and Telecourses
PI: G. Robert Converse $499,938 ($499,938)
University of Hawaii Honolulu, HI 96822-2225
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
CoPI: Steve George : University of Hawaii Maui Community College

IDAHO

DUE-9451053
Use of Gas Chromatography/Mass Spectrometry in Interdisciplinary Technical Education
PI: Lorie Juhl $38,553 ($38,553)
Eastern Idaho Technical College Idaho Falls, ID 83404-5788
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

NCR-9405662
North Idaho College Connections to NSFNET
PI: Mary Carr
North Idaho College
NETWORK INFRASTRUCTURE
CoPI: Eric Hood : West Interstate Commission Higher Education

$24,576 ($24,576)
Coeur D Alene, ID 83814-2161

ILLINOIS

DUE-9354471
An Algebra Reform Curriculum for Community College Students: Evaluating Effects of Students/Faculty Perceptions on Implementation.
PI: Mercedes McGowen
William Rainey Harper College
DUE COURSE & CURRICULUM PROGRAM

$198,907 ($198,907)
Palatine, IL 60067

DUE-9450684
The Greater Chicago Consortium for Chemistry Reform
PI: Donald Wink
University of Illinois Chicago
DUE COURSE & CURRICULUM PROGRAM
CoPI: Barbara Bakel : William Rainey Harper College
CoPI: Jack Kaeck : Chicago State University

$49,776 ($49,776)
Chicago, IL 60680-6998

DUE-9456023
Chicago Consortium for Applications of Mathematics Across the Curriculum
PI: Neil Berger
University of Illinois Chicago
DUE COURSE & CURRICULUM PROGRAM
CoPI: Florence Appel : Saint Xavier College
CoPI: Mercedes McGowen : William Rainey Harper College

$49,958 ($49,958)
Chicago, IL 60680-6998

DUE-9353998
Community College Physics Faculty Development Project
PI: Curtis Hieggelke
Joliet Junior College
UNDERGRADUATE FACULTY ENHANCEMENT PROGRAM

$219,654 ($219,654)
Joliet, IL 60436-9002

DUE-9452120
Electrical Power Control Laboratory
PI: Robert Laursen
Parkland College
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

$22,238 ($22,238)
Champaign, IL 61820-3616

DUE-9452561
Algae and the Ecosystem: A Laboratory Project for Undergraduates
PI: James Burnett $8,600 ($8,600)
Illinois Eastern Community College Olney Center Olney, IL 62450-1043
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

INDIANA

BES-9307650
Modeling FM Bat Sonar: An Approach Based on Neurophysiology, Artificial Neural Networks and Multi-Resolution Signal Analysis
PI: Matthew Palakal $83,451 ($258,059)
Indiana University-Bloomington Bloomington, IN 47402-1847
BIOMEDICAL ENGINEERING
CoPI: H. Oner Yurtseven : Indiana University Purdue University
CoPI: Donald Wong : Indiana Vocational Technical College

IOWA

DUE-9454606
North Central Center for Advanced Engineering Technology Education in NDE/NDT
PI: David Holger $50,000 ($50,000)
Iowa State University Ames, IA 50011
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
In Partnership With : Hutchinson Technical College
In Partnership With : Moraine Valley Community College
In Partnership With : Northeast Iowa Community College

DUE-9454638
Advanced Technology Environmental Education Center (ATEEC)
PI: Ellen Kabat $999,961 ($2,999,866)
Eastern Iowa Community College District Cedar Rapids, IA 52404-5260
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
CoPI: Paul Dickinson : Partners for Environmental Technology Education
CoPI: Edward Brown : University of North Iowa

NCR-9318828
NIACC's NSFNET Connections Project
PI: Mark Greenwood $22,300 ($22,300)
North Iowa Area Community College Mason City, IA 50401-7213
NETWORK INFRASTRUCTURE

NCR-9318917
Kirkwood NSFNet Connection
PI: Roger Seamands
Kirkwood Community College
NETWORK INFRASTRUCTURE

$15,150 ($15,150)
Cedar Rapids, IA 52406-2068

KANSAS

DUE-9454618
Two Year Associate of Technology Curriculum Development for GIS/GPS Technologies
PI: James Keating
Kansas State University
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
CoPI: Stephen Thompson : Kansas College of Technology

$500,000 ($500,000)
Manhattan, KS 66506

ESI-9353816
Development of a Staff Development Model to Enhance the Use of Hands-On Science Teaching in Rural Elementary Schools: A Planning Proposal
PI: John Staver
Kansas State University
TEACHER ENHANCEMENT PROGRAM
CoPI: Richard Eby : Cloud County Community College

$49,999 ($49,999)
Manhattan, KS 66506

ESI-9353844
STARS: Student Training Academy for Research in Science
PI: Peter Hamlet
Pittsburg State University
YOUNG SCHOLARS PROGRAM

$64,714 ($130,600)
Pittsburg, KS 66762-5856

KENTUCKY

DUE-9454585
Kentucky Advanced Technology Education Project
PI: Anthony Newberry
University of Kentucky Community College System
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
CoPI: Darrell Abney : Maysville Community College
CoPI: Lillie Crowley : Lexington Community College

$799,991 ($799,991)
Lexington, KY 40506

DUE-9452356
Mobile Computer Laboratory Project
PI: Roger Angevine $15,275 ($15,275)
Somerset Community College Somerset, KY 41
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT
DUE-9452472

A Computer Algebra System for Calculus
PI: Lillie Crowley $45,000 ($45,000)
Lexington Community College Lexington, KY 40506
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT
CoPI: John Ott : Lexington Community College

MASSACHUSETTS

DUE-9454575
Hands On Physics: A New Conception of Physics
PI: Robert Tinker, TERC Inc. $432,743 ($432,743)
Concord Consortium Concord, MA 01742-4023
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
CoPI: Hilton Abbott: Springfield Technical Community College
CoPI: John King, Massachusetts Institute of Technology

DUE-9454642
Advanced Biotechnology Education Project
PI: Barry Werner $347,978 ($1,132,394)
Middlesex Community College Bedford, MA 01730
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
CoPI: Pamela Weathers : Worcester Polytech Institute
CoPI: James Amara : Minuteman Reg Vocational Technical School

DUE-9354547
TEME: A Plan for Interdisciplinary Curriculum Development in Hands-on Science Education for Middle School and Community College Students
PI: Daniel LaRose $83,225 ($83,225)
Greenfield Community College Greenfield, MA 01301
DUE COURSE & CURRICULUM PROGRAM

DUE-9353997
Fiber Optics for Engineering Technology
PI: Elias Awad $89,102 ($89,102)
Wentworth Institute of Technology Boston, MA 02115-5998
UNDERGRADUATE FACULTY ENHANCEMENT PROGRAM
CoPI: James O'Brien : Bunker Hill Community College

DUE-9451410
Project TEME: A Windows for Workgroups Peer-to-Peer Network for Hands-On Science Education in a Multimedia Simulation Laboratory
PI: Daniel LaRose $20,229 ($20,229)
Greenfield Community College Greenfield, MA 01301
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

DUE-9451664
Improving the Anatomy and Physiology Course by Developing a Computer Laboratory
PI: Anne Miller $36,303 ($36,303)
Middlesex Community College Bedford, MA 01730
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

DUE-9452536
Computer-based Equipment Platforms in Introductory Labs for Technology Students
PI: Scott Ferguson $19,087 ($19,087)
Franklin Institute of Boston Boston, MA 02116-6342
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

ESI-9453921
Math/Science Enhanced Manufacturing Technology Training for Females and Minorities
PI: James Amara $185,706 ($356,076)
Minuteman Reg Vocational Technical School Le on, MA 02173
TEACHER ENHANCEMENT PROGRAM
In partnership with: Middlesex Community College, Bedford, MA

EW- 20242
The Changing Landscape of Lowell: Where the Past Meets the Future
PI: Gail Mooney $31,000 ($31,000)
Middlesex Community College Bedford, MA 01730
LEADERSHIP OPPORTUNITY IN SCIENCE AND HUMANITIES

MCB-9307206
The Regulation of Prostaglandin Synthesis at the Molecular Level of Cyclooxygenase
PI: Bruce Jackson $179,720 ($179,720)
Massachusetts Bay Community College Boston, MA 02118-2394
METABOLIC BIOCHEMISTRY

MARYLAND

BIR-9413986
Utilization of Instrumentation in a Biotechnology Program
PI: Susan Youngren $38,767 ($38,767)
Villa Julie College Stevenson, MD 21153
INSTRUMENTATION & INSTRUMENT DEVELOPMENT PROGRAM

DUE-9453250
Mid-Atlantic Center for Advanced Technological Education
PI: O. Robert Brown — $50,000 ($50,000)
Montgomery College Rockville — Rockville, MD 20850-1101
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM

DUE-9354604
Enhancing Scientific Literacy Among Non-Major Students Using a Variety of Approaches in Introduction to Psychology
PI: Robert Sawyer — $94,911 ($94,911)
Catonsville Community College — Catonsville, MD 21228-5317
DUE COURSE & CURRICULUM PROGRAM

DUE-9255537
Maryland Undergraduate Mathematics Enhancement Program (MUMEP)
PI: Denny Gulick — $40,178 ($189,949)
University of MD College Park — College Park, MD 20742
UNDERGRADUATE FACULTY ENHANCEMENT PROGRAM
Co-PI: Jon Scott, Montgomery College, MD
Co-PI: Eldon Baldwin, Prince George's Community College, Largo, MD

DUE-9451308
Computer-Assisted Real-World Problem-Solving Laboratories for Undergraduate Mathematics
PI: Zoe Irvin — $41,835 ($41,835)
Howard Community College — Columbia, MD 21044
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

ESI-9353887
Young Scholars Field Research Institute
PI: Patricia Cunniff — $47,683 ($95,549)
Prince George's Community College — Largo, MD 20772-2199
YOUNG SCHOLARS PROGRAM

MCB-9407612
RUI: Ty Insertional Mutagenesis in Yeast
PI: Molly Mastrangelo — $110,354 ($110,354)
Allegany Community College — Cumberland, MD 21502
MICROBIAL GENETICS

MCB-9219309
Structural and Thermodynamic Studies on Protein G
PI: John Orban — $125,000 ($635,000)
Maryland Biotech Institute — College Park, MD 20740-3210
MOLECULAR BIOPHYSICS
CoPI: Philip Bryan : Villa Julie College

NCR-9318243
Connection to NSFNET
PI: Deborah McBee
Villa Julie College
NETWORK INFRASTRUCTURE
$24,500 ($24,500)
Stevenson, MD 21153

NCR-9318600
Connection to NSFNET
PI: Gerald Waterson
Chesapeake College
NETWORK INFRASTRUCTURE
$25,000 ($25,000)
Wye Mills, MD 21679

NCR-9413060
Harford Community College Connection to the Southeastern Universities Research Association Network
PI: Joanna Petkovsek
Harford Community College
NETWORK INFRASTRUCTURE
$42,757 ($42,757)
Bel Air, MD 21015-1627

NCR-9417290
Connections to NSFNET
PI: Donald Greenawalt
Prince George's Community College
NETWORK INFRASTRUCTURE
$25,000 ($25,000)
Largo, MD 20772-2199

NCR-9442257
Connection to NSFNET
PI: Deborah McBee
Villa Julie College
NETWORK INFRASTRUCTURE
$10,000 ($10,000)
Stevenson, MD 21153

MAINE

DUE-9451312
Field Experience in Limnological Sampling and Data Analysis
PI: Daniel Buckley
University of Maine - Farmington
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT
$10,544 ($10,544)
Farmington, ME 04938-1911

MICHIGAN

DUE-9454620
A Revision of Technical Physics
PI: Robert Eshelman — $129,670 ($129,670)
Henry Ford Community College — Dearborn, MI 48128-2407
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM

DUE-9454660
Planning Grant for the Southeast Michigan Alliance for Reinvestment in Technological Education (SMARTE) Center
PI: Mulchand Rathod — $50,000 ($50,000)
Wayne State University — Detroit, MI 48202-3900
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
CoPI: Cora Eubanks : Detroit Public Schools
CoPI: Rahmatollah Golshan : Wayne County Community College
CoPI: Catherine Ferman : Schoolcraft College

DUE-9452012
Expansion of Delta College's Undergraduate Analytical Chemistry Capabilities Through GC/MS
PI: Ronald Sharp — $37,474 ($37,474)
Delta College — University Center, MI 48710
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

DUE-9452436
A Revision of Technical Mathematics Based on the National Council of Teachers of Mathematics Standards
PI: Barbara Near — $20,063 ($20,063)
Henry Ford Community College — Dearborn, MI 48128-2407
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

NCR-9318975
Internet Connection for Grand Rapids Community College
PI: Karen Bergin — $23,460 ($23,460)
Grand Rapids Community College — Grand Rapids, MI 49503-3201
NETWORK INFRASTRUCTURE

NCR-9319113
CONNECTION TO NSFNET THROUGH MICHNET
PI: Jack Green — $23,000 ($23,000)
Lake Michigan College — Benton Harbor, MI 49022-1881
NETWORK INFRASTRUCTURE
CoPI: K Sundaram : Lake Michigan College

NCR-9406570
NSFNET Connectivity for West Shore Community College, The Mason, Lake and Ocean Math/Science Center, and Consortium School Districts
PI: Debra Hanna — $22,500 ($22,500)
West Shore Community College — Scottville, MI 49454-9716
NETWORK INFRASTRUCTURE

NCR-9417577
NSFNET Connectivity for Davenport College
PI: Kevin O'Halla — $25,000 ($25,000)
Davenport College — Grand Rapids, MI 49503-4407
NETWORK INFRASTRUCTURE

MINNESOTA

CDA-9417390
A Cooperative Learning Environment that Fosters the Pursuit of Scientific Careers for American Indians
PI: Ted Wetherbee — $271,554 ($1,380,523)
Fond du Lac Tribal College — Cloquet, MN 55720
CISE INSTITUTIONAL INFRASTRUCTURE

NCR-9496226
NSFNET Access
PI: Ted Wetherbee — $20,979 ($20,979)
Fond du Lac Tribal College — Cloquet, MN 55720
NETWORK INFRASTRUCTURE

DUE-9454551
CoNet Center of Excellence for Advanced Technological Education in Networking Communications and Interactive Mass Media
PI: Chandler Stevens — $271,802 ($500,000)
Minnesota Riverland Technical College — Austin, MN 55912-1473
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM

MISSOURI

DUE-9452523
Technological Engagement in the Mathematics Curriculum
PI: Larry Sherwood — $38,681 ($38,681)
Metropolitan Community College Penn Valley — Kansas City, MO 64111
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

NEBRASKA

DUE-9453243
A Center of Excellence for Chemistry-Based Technician Education
PI: John Kenkel — $49,983 ($49,983)
Southeast Community College — Lincoln, NE 68520-1227
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM

NEW HAMPSHIRE

DUE-9451672
New Hampshire Biotechnology Technician Education and Training
PI: Sonia Sparks Wallman — $80,000 ($80,000)
New Hampshire Vocational Technical College - Manchester — Manchester, NH 03102-8528
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

NEW JERSEY

DUE-9453258
New Jersey Consortium for Advanced Technological Education Planning Project
PI: John Bakum — $49,968 ($49,968)
Middlesex County College — Edison, NJ 08818
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM

DUE-9454538
Industrial Controls Laboratory and Course in Manufacturing Engineering Technology
PI: Melvin Roberts — $160,000 ($160,000)
Camden County College — Blackwood, NJ 08012
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
CoPI: James Hudgings : South New Jersey Computer Integrated Manufacturing

DUE-9454604
Integrating Technical Applications into the Learning of Mathematics: A Collaborative Effort
PI: Reginald Luke — $169,813 ($169,813)
Middlesex County College — Edison, NJ 08818
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM

DUE-9451321
Development of an Advanced Fiber Optic Laboratory
PI: Fred Seeber — $95,988 ($95,988)
Camden County College — Blackwood, NJ 08012
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

DUE-9451371
Rapid Prototyping System
PI: James Hudgings — $99,900 ($99,900)
Camden County College — Blackwood, NJ 08012
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

NEW MEXICO

DUE-9455985
Mathematical Sciences and their Applications Throughout the Curriculum
PI: Allan Gutjahr — $50,000 ($50,000)
New Mexico Institute of Mining & Technology — Socorro, NM 87801
DUE COURSE & CURRICULUM PROGRAM
In Partnership With : Navajo Community College
In Partnership With : San Juan College

DUE-9451088
Computer Classroom in Algebra Reform
PI: George Pletsch — $64,805 ($64,805)
Albuquerque Technical Vocational Institute — Albuquerque, NM 87106-4023
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT
CoPI: Maureen Kelly : Albuquerque Technical Vocational Institute

HRD-9154000
Navajo Community College Science Honors Program
PI: Mark Bauer — $149,801 ($566,284)
Navajo Community College — Shiprock, NM 87420
DIVISION OF HUMAN RESOURCE DEVELOPMENT

NCR-9402302
SIPI Connections
PI: Tom Abbott — $19,847 ($19,847)
Southwest Indian Polytechnic Institute — Albuquerque, NM 87120-3101
NETWORK INFRASTRUCTURE

STS-9321061
Science and Popular Culture
PI: William Eamon — $80,000 ($80,000)
New Mexico State University — Las Cruces, NM 88003-3699
SCIENCE AND TECHNOLOGY STUDIES

NEW YORK

CHE-9123802
Peptide Models of Biological Electron Transfer: Experiment and Theory
PI: Alvin Joran — $70,000 ($204,600)
New York University — New York, NY 10012
INORGANIC, BIOINORGANIC & ORGANOMETALLIC
CoPI: Yuri Magarshak : Mt Sinai School of Medicine
Co-PI: Joesph Malinsky, CUNY Bronx Community College

DUE-9453260
Planning Grant for a National Center of Excellence for Advanced Technological Education
PI: Charles Merideth — $50,000 ($50,000)
CUNY New York City Technical College — Brooklyn, NY 11201-2902
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
CoPI: Leonard Ciaccio : CUNY Staten Island
CoPI: Sadie Bragg : CUNY Borough of Manhattan Community College
CoPI: Russell Holtzer : CUNY Queensborough Community College

DUE-9454613
Technology Instruction for the 21st Century
PI: Bernard Mohr — $197,013 ($500,000)
CUNY Queensborough Community College — New York, NY 11364
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM

DUE-9354803
Curriculum Development in Physics-Introductory Electricity & Magnetism
PI: Marie Plumb — $40,424 ($40,424)
SUNY Jamestown Community College — Jamestown, NY 14701-1920
DUE COURSE & CURRICULUM PROGRAM

DUE-9442507
Mastery of Engineering Technology
PI: Bernard Mohr — $21,077 ($345,549)
CUNY Queensborough Community College — New York, NY 11364
DUE COURSE & CURRICULUM PROGRAM

DUE-9455998
Long Island Consortium for Mathematical Sciences Throughout the Curriculum
PI: Ronald Douglas — $47,905 ($47,905)
SUNY Stony Brook — Stony Brook, NY 11794
DUE COURSE & CURRICULUM PROGRAM
CoPI: John Winn : SUNY Farmingdale

DUE-9156213
Improving Scientific Literacy of Undergraduate Students through "Hands-On" Multidisciplinary Science Courses
PI: Rhoda Berenson $59,056 ($158,325)
SUNY Nassau County Community College Garden City, NY 11530-4533
INTRODUCTORY CURRICULUM PROJECTS

DUE-9353963
Workshop to Enhance Computing Faculty at Two-Year Colleges Serving Native Americans
PI: Karl Klee, Jamestown Community College, Jamestown, NY $26,400 ($26,400)
Association For Computing Machinery New York, NY 10036-8002
UNDERGRADUATE FACULTY ENHANCEMENT PROGRAM

DUE-9353967
Undergraduate Faculty Enhancement: Animation and Portfoliosin PreCalculus, Calculus and Differential Equations
PI: Patricia Wilkinson $106,580 ($106,580)
CUNY Borough Manhattan Community College New York, NY 10007-1079
UNDERGRADUATE FACULTY ENHANCEMENT PROGRAM

DUE-9450870
Computerization of the General Chemistry Laboratory Program
PI: George Potter $20,810 ($20,810)
SUNY Schenectady County Community College Schenectady, NY 12305
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

DUE-9451689
Collaborative Learning Through Interactive Animation for Mathematics and Computer Science
PI: David Sher $38,046 ($38,046)
SUNY Nassau County Community College Garden City, NY 11530-4533
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

DUE-9452053
Enhancing the Mathematics Curriculum: A Laboratory Approach
PI: Dennis Callas $26,201 ($26,201)
SUNY Technical Delhi Delhi, NY 13753-1190
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

DUE-9452057
Improvement of Undergraduate Education in the Sciences Through the Use of Cooperative Learning with the Aid of Multimedia
PI: Frederick Onasch $53,694 ($53,694)
SUNY Technical Delhi Delhi, NY 13753-1190
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

DUE-9452071
Helping At Risk Students Succeed in Engineering by Emphasizing Laboratory Experiences in Physics
PI: Robert Sells $13,468 ($13,468)
SUNY Technical Alfred Alfred, NY 14802-1196
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

DUE-9452547
Physics Laboratory Computerized Data Acquisition and Analysis in Electricity and Magnetism
PI: Marie Plumb $31,712 ($31,712)
SUNY Jamestown Community College Jamestown, NY 14701-1920
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

DUE-9452566
Instrumentation for Global Positioning Satellite Surveying
PI: Matthew Bartholomew $26,902 ($26,902)
SUNY Technical Alfred Alfred, NY 14802-1196
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

DUE-9452583
Monroe Community College Physics Laboratory Project
PI: Paul D'Alessandris $9,818 ($9,818)
SUNY Monroe Community College Rochester, NY 14623-5701
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

HRD-9450487
SSC: "Science Summer Camp and Academic Year Follow-Up Program"
PI: Norman Shapiro $98,472 ($295,416)
CUNY City College New York, NY 10031
SUMMER SCIENCE CAMPS
CoPI: Carl Berkowitz : CUNY Bronx Community College

NCR-9417327
Genesee Community College Connects!
PI: Kenneth Mead $16,900 ($16,900)
SUNY Genesee Community College Batavia, NY 14020-9703
NETWORK INFRASTRUCTURE

NORTH CAROLINA

ESI-9353062
National Science Foundation Young Scholars Program at Chowan College
PI: Garth Faile $35,021 ($71,165)
Chowan College Murfreesboro, NC 27855
YOUNG SCHOLARS PROGRAM

NORTH DAKOTA

ESI-9352979
Mathematics for Indians Summer Horizon Institute (MISHI)
PI: Sunil Karnawat — $65,592 ($134,160)
Turtle Mountain Community College — Belcourt, ND 58316
YOUNG SCHOLARS PROGRAM

OSR-9452803
High Plains Rural Systemic Initiative
PI: W. Larry Belgarde — $140,000 ($140,000)
Turtle Mountain Community College — Belcourt, ND 58316
RURAL SYSTEMIC INITIATIVE PROGRAM

OHIO

DUE-9454518
Partnership for the Advancement of Chemical Technology (PACT)
PI: Arlyne Sarquis — $400,000 ($1,200,000)
Miami University - Middletown — Middletown, OH 45042-3458
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
CoPI: Vijay Gupta : Central State University

DUE-9454571
National Center of Excellence for Advanced Manufacturing Education (NCE/AME)
PI: David Harrison — $1,000,000 ($3,000,000)
Sinclair Community College — Dayton, OH 45402-1421
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
CoPI: Lawrence Howell : University of Dayton

DUE-9354378
General Chemistry: Discovery-Based Advances for the Two Year College Chemistry Curriculum
PI: Arlyne Sarquis — $142,386 ($142,386)
Miami University - Middletown — Oxford, OH 45056
DUE COURSE & CURRICULUM PROGRAM
CoPI: John Williams : Miami University Hamilton Campus

DUE-9451751
Integrating Computer-Based Experiments into the Economics Classroom
PI: Gregory Delemeester — $20,426 ($20,426)
Marietta College — Marietta, OH 45750
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT
CoPI: R. David Mullin : Bowling Green University Firelands

BEST COPY AVAILABLE

DUE-9452487
Multi-Dimensional Learning Lab
PI: Rich Coulson — $14,983 ($14,983)
Marion Technical College — Marion, OH 43302-5628
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

ESI-9355523
Teaching Science With Toys: Cultivating Advancements in Physical Science (TOYS: CAPS)
PI: Arlyne Sarquis — $406,358 ($1,524,090)
Miami University - Middletown — Oxford, OH 45056
TEACHER ENHANCEMENT PROGRAM

ESI-9353013
Young Investigators Three-Week Summer Institute on Science and Agriculture
PI: Clyde Opliger — $71,967 ($146,420)
Ohio State University Research Agricultural Technical Institute — Columbus, OH 43210-1016
YOUNG SCHOLARS PROGRAM

OREGON

DUE-9453262
Northwest Regional Center for Sustainable Resources Project
PI: Wynn Cudmore — $47,520 ($47,520)
Chemeketa Community College — Salem, OR 97309-7070
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
CoPI: Charles Getter : Research Planning Institute Columbia

DUE-9454589
Advanced Technological Education Programs in Semiconductor Manufacturing
PI: David Hata — $100,000 ($200,000)
Portland Community College — Portland, OR 97219-7197
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
CoPI: David Ings : Oregon Institute of Technology

DUE-9454627
The Application-based, Technology-supported, One-Track Mathematics Curriculum Program (ATO)
PI: Pamela Matthews — $469,923 ($469,923)
Mount Hood Community College — Gresham, OR 97030-3300
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM

DUE-9452028
A Proposal for the Implementation of a Mathematics Activity Resource Center (MARC)
PI: Franz Helfenstein — $35,146 ($35,146)
Central Oregon Community College — Bend, OR 97701-5933
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

DUE-9452104
Integrating Investigative Labs into the Biology Curriculum
PI: Michael Bunch — $20,561 ($20,561)
Clatsop Community College — Astoria, OR 97103
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

HRD-9353096
PPD: International Survey of Access-Technologies
PI: Carolyn Gardner — $21,454 ($21,454)
Linn Benton Community College — Albany, OR 97321-3755
PROGRAMS FOR PERSONS WITH DISABILITIES

NCR-9318957
Clackamas Community College Connection to North-West Net
PI: Paul Rothi — $25,000 ($25,000)
Clackamus Community College — Oregon City, OR 97045-8980
NETWORK INFRASTRUCTURE
CoPI: Eric Hood : Western Interstate Commission Higher Education

NCR-9402816
Mt. Hood Community College Networks Connection
PI: Jeff Moore — $25,000 ($25,000)
Mount Hood Community College — Gresham, OR 97030-3300
NETWORK INFRASTRUCTURE

NCR-9417216
NSFNET Connection for Lane Community College
PI: Jim Keizur — $25,300 ($25,300)
Lane Community College — Eugene, OR 97405
NETWORK INFRASTRUCTURE
CoPI: Eric Hood : Western Interstate Commission Higher Education

PENNSYLVANIA

DUE-9454547
A Partnership for Excellence in Engineering Technology Education
PI: Wayne Hager — $282,000 ($658,000)
Pennsylvania State University - University Park — University Park, PA 16802-1503
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
In Partnership With : Pennsylvania State University - York

DUE-9450980
Acquisition of a Blow Molding Machine for Plastics Processing Laboratory
PI: Robert Farrell $76,007 ($76,007)
Pennsylvania State University - University Park University Park, PA 16802-1503
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

DUE-9451522
Advanced Geodetic Science and Surveying Curriculum Development
PI: William Sprinsky $60,909 ($60,909)
Pennsylvania College of Technology Williamsport, PA 17701-5778
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

DUE-9451683
The Scientific Method and Computer Literacy A New Biology Lab Curriculum at PSU Ogontz
PI: C. Leah Devlin $45,660 ($45,660)
Pennsylvania State University -University Park University Park, PA 16802-1503
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT
CoPI: John Ashley : Penn State University Ogontz Campus

DUE-9452559
Development of Environmental Technology Laboratory and Field Manual
PI: Alfred Hoffmann $58,600 ($58,600)
Montgomery County Community College Blue Bell, PA 19422-1412
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

ESI-9355468
Graphics Calculators And Internet Coalition Conference
PI: Roseanne Hofmann $75,174 ($75,174)
Montgomery County Community College Blue Bell, PA 19422-1412
TEACHER ENHANCEMENT PROGRAM

ESI-9441964 (DUE Supplement for Community College Teachers)
Graphics Calculators And Internet Coalition Conference
PI: Roseanne Hofmann $7,825 ($7,825)
Montgomery County Community College Blue Bell, PA 19422-1412
TEACHER ENHANCEMENT PROGRAM

NCR-9314003
Connection to PREPNET
PI: James Cunningham $37,720 ($37,720)
Pennsylvania College of Technology Williamsport, PA 17701-5778
NETWORK INFRASTRUCTURE

NCR-9402247
Connections to NSFNET
PI: Pedro Navarro — $24,000 ($24,000)
Delaware City Community College — Media, PA 19063
NETWORK INFRASTRUCTURE

NCR-9421571
Connection to PREPnet
PI: Kathleen Murphy — $24,000 ($24,000)
Mt Aloysius Jr. College — Cresson, PA 16630
NETWORK INFRASTRUCTURE

PUERTO RICO

DUE-9454640
Industry-Academia Partnership Project: Computerized and Electronics Programs Improvements for High Risk Minority Students Retention/Improved Employment Opportunities
PI: Felix Rodriquez Matos — $50,000 ($50,000)
Huertas Junior College — Caguas, PR 00726
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM

SOUTH CAROLINA

CHE-9411143
Spectroscopic Studies of 1, 3, 5 Triphenylformazan in Solution and in Polymer Systems
PI: Nina Veas — $18,000 ($18,000)
Coastal Carolina University — Conway, SC 29526-1954
ORGANIC & MACROMOLECULAR CHEMISTRY PROGRAM

DUE-9454536
Establishment of an Instrumentation Calibration Laboratory
PI: Ron Ingle — $123,904 ($123,904)
Piedmont Technical College — Greenwood, SC 29646
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM

DUE-9454654
South Carolina Center of Excellence in Advanced Technological Education Planning Grant
PI: James Wood — $50,000 ($50,000)
Tri-County Technical College — Pendleton, SC 29670
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
CoPI: Edmund Boothe : Aiken Technical College

DUE-9451529
Integrated Manufacturing Systems
PI: John Davis $30,621 ($30,621)
Chesterfield-Marlboro Technical College Cheraw, SC 29520-1007
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

DUE-9451651
A Model Integrated Physical Sciences Laboratory
PI: Catherine Almquist $55,937 ($55,937)
Trident Technical College Charleston, SC 29411
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

DUE-9452289
Innovative Approaches to Teaching Microbiology
PI: Jayne McClain $11,024 ($11,024)
Greenville Technical College Greenville, SC 29606-5616
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

SOUTH DAKOTA

ESI-9353470
Native American Mathematics and Science Education Leadership
PI: Leland Bordeaux $504,599 ($1,637,101)
Sinte Gleska College Center Rosebud, SD 57570
TEACHER ENHANCEMENT PROGRAM
CoPI: David Weisser : Arizona State University

TENNESSEE

DUE-9454648
Planning a Center for Advancement of Emerging Technology Applications
PI: James Barrott $50,000 ($50,000)
Chattanooga State Technical Community College Chattanooga, TN 37406-1018
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
CoPI: Frank Irlinger : Nashville State Technical Institute

DUE-9443721
Curriculum and Pedagogy Reform at Two-Year Colleges: Moving Beyond Myths to Standards
PI: Marilyn Mays $10,175 ($10,175)
American Mathematical Association Two-Year Colleges Memphis, TN 38134
DUE COURSE & CURRICULUM PROGRAM
CoPI: Dale Ewen : Parkland College
CoPI: Karen Sharp : Charles S. Mott Community College

DUE-9353951
East Tennessee Math Modeling Consortia
PI: Patricia Preston — $127,949 ($127,949)
Pellissippi State Technical Community College — Knoxville, TN 37932-1412
UNDERGRADUATE FACULTY ENHANCEMENT PROGRAM

TEXAS

DUE-9453257
Texas Center for the Replication of Excellence in Advanced Technological Education (Texas Create)
PI: Steve Rodi — $48,362 ($48,362)
Austin Community College — Austin, TX 78768-2285
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
CoPI: Hassan Moghaddam : San Jacinto Central Campus
CoPI: Robert Benson : Austin Community College
CoPI: Therese Jones : Amarillo College

DUE-9454508
Interactive Multimedia Instruction for Advanced Instrumentation Technology
PI: Kenneth Sweeney — $247,823 ($247,823)
Alvin Community College — Alvin, TX 77511-4807
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM

DUE-9454531
Biomedical Electronic Engineering Technology Project
PI: Reddy Talusani — $49,963 ($49,963)
Houston Community College — Houston, TX 77270-7849
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM

DUE-9454569
A Consortium for the Development of Advanced Manufacturing Education
PI: Bartlett Sheinberg — $304,000 ($604,000)
Houston Community College — Houston, TX 77270-7849
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
CoPI: Farouk Attia : Northwest College

DUE-9454572
South Texas Advanced Technological Education Center
PI: Cecilia Gonzales — $99,984 ($99,984)
San Antonio College — San Antonio, TX 78212-4201
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
CoPI: Judith Cardenas : Palo Alto College

DUE-9454643
Southwest Center for Advanced Technological Education
PI: Robert Musgrove — $565,872 ($1,711,637)
Texas State College Sweetwater — Sweetwater, TX 79556-9803
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
CoPI: Therese Jones : Amarillo College
CoPI: Oliver Hensley : Texas Technical University

DUE-9454651
Technical Sciences Academy Proposal
PI: Therese Jones — $630,000 ($630,000)
Amarillo College — Amarillo, TX 79178
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM

DUE-9454655
Advanced Technical Education (ATE) Alliance
PI: James Jordan — $499,950 ($1,495,500)
Consortium for Advanced Manufacturing International — Arlington, TX 76011-4909
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
CoPI: William Angus : Charles S Mott Community College
CoPI: Roy Shelton : Lawrence Technical University

DUE-9450604
Multiple Entry Into Undergraduate Chemical Sciences
PI: James Whitesell — $50,000 ($50,000)
University of Texas Austin — Austin, TX 78712-9998
DUE COURSE & CURRICULUM PROGRAM
CoPI: Michael Doyle : Trinity University
CoPI: Eamonn Healy : Saint Edward's University
CoPI: Kathy Nabona : Austin Community College

DUE-9354017
Two-Year College Physics Faculty Enhancement Program
PI: Robert Clark — $134,432 ($268,864)
Texas A&M — College Station, TX 77843-3577
UNDERGRADUATE FACULTY ENHANCEMENT PROGRAM
CoPI: Thomas O'Kuma : Lee College

DUE-9450952
Thru-Hole Soldering and Surface-Mount Technology Electronic Laboratory Development
PI: Arnulfo Garcia — $52,939 ($52,939)
Texas State Technical Institute - Harlingen — Harlingen, TX 78551-2628
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

DUE-9451815
Development of Multimedia Instruction Lab Facilities for Computer Science Majors
PI: Vanessa Huse $21,146 ($21,146)
Kilgore College Kilgore, TX 75662-3204
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

DUE-9451959
Southwest Texas Junior College Introductory Physics Laboratory Project
PI: Mary Monroe $18,818 ($18,818)
Southwest Texas Jr. College Uvalde, TX 78801
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

DUE-9451987
Fourier-Transform Infrared Spectroscopy in the Chemistry Curriculum
PI: Jagdish John $61,149 ($61,149)
Houston Community College Houston, TX 77270-7849
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

DUE-9452407
Interdisciplinary Graphics Laboratory Improvement
PI: Michael Coler $35,450 ($35,450)
Texas St College at Sweetwater Sweetwater, TX 79556-9803
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

NCR-9402177
Austin Community College Internet Connection Project
PI: W. Hisle $23,940 ($23,940)
Austin Community College Austin, TX 78768-2285
NETWORK INFRASTRUCTURE

VERMONT

DUE-9451447
An Integrated, Comprehensive Design Project for Rehabilitation Engineering Technology Students
PI: Darlene Miller $30,747 ($30,747)
Vermont Technical College Randolph Center, VT 05061
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

VIRGINIA

DUE-9454577
A Model Rural Appalachian Partnership to Improve Technology Education through Faculty Enhancement and Curriculum Development Activities
PI: Gary Laing — $197,873 ($197,873)
Wytheville Community College — Wytheville, VA 24382-3308
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM

DUE-9454615
TechQuest: A Center for Advanced Technological Education in Virginia Planning Grant
PI: Michael Bishara — $49,858 ($49,858)
Southwest Virginia Community College — Norfolk, VA 23508
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
CoPI: Mary Sandy : VA Space Grant Consortium

DUE-9452329
Integration of Computer Integrated Manufacturing Cell Applications into Electronics Degree Program
PI: Montie Fleshman — $96,837 ($96,837)
Wytheville Community College — Wytheville, VA 24382-3308
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

ESI-9353015
Governor's School Strengthening Grant
PI: William Allgyer — $41,775 ($83,780)
Mountain Empire Community College — Big Stone Gap, VA 24219
YOUNG SCHOLARS PROGRAM

GER-9450178
NATO EAST EUROPE: Quaternary Beachrock of Modern and Ancient Lake Issyk-kul: Geologic and Climatic Significance
PI: Kenneth Rasmussen — $3,830 ($3,830)
Northern Virginia Community College -- Annandale Campus — Annandale, VA 22003-3743
INSTITUTIONAL AND POSTDOCTORAL PROGRAMS UNIT

IMD-9355826
Technology for All Americans
PI: William Dugger — $499,999 ($499,999)
International Technology Education Association — Reston, VA 22091-1538
INSTRUCTIONAL MATERIALS DEVELOPMENT

WASHINGTON

DUE-9353969
Washington Center Interdisciplinary Science Faculty Development Project
PI: Barbara Smith — $216,550 ($216,550)
Evergreen State College — Olympia, WA 98505
UNDERGRADUATE FACULTY ENHANCEMENT PROGRAM
CoPI: Judith Moore : Yakima Valley Community College

DUE-9452046
Improving Student Retention, Success and Matriculation in Algebra, Precalculus and Calculus
PI: Douglas Mooers — $8,643 ($8,643)
Whatcom Community College — Bellingham, WA 98226 9050
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

DUE-9452258
Learning Chemistry in Laboratory Settings: A Mini-Course Approach
PI: M. Rachel Wang — $57,132 ($57,132)
Spokane Community College — Spokane, WA 99207 5320
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

HRD-9450492
SSC: "The Biosphere of Tomorrow-Summer Science Camp"
PI: Herb Bryce — $192,157 ($290,644)
Seattle Central Community College — Seattle, WA 98122-2413
PRE COLLEGE SUPPORT PROGRAM
CoPI: Teresa Tipton : Seattle Community College District Office

NCR-9318799
Connecting to NSFNET
PI: Barry Boyer — $27,574 ($27,574)
Pierce College — Tacoma, WA 98498-1919
NETWORK INFRASTRUCTURE

NCR-9402654
NSFNET Connection for Tacoma Community College
PI: Edward Zimmerman — $20,638 ($20,638)
Tacoma Community College — Tacoma, WA 98465-1950
NETWORK INFRASTRUCTURE

WISCONSIN

DMS-9406573
Mathematical Sciences: RUI Problems in Magnetohydrostatic Equilibrium Arising in the Study of the Solar Corona
PI: Edward Stredulinsky $38,000 ($38,000)
University of Wisconsin Richland Madison, WI 53706-1490
APPLIED MATHEMATICS

DUE-9454555
An Advanced Biotechnology Education Partnership Program
PI: Joy McMillan $400,000 ($1,000,000)
Madison Area Technical College Madison, WI 53703-2285
ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
CoPI: Michael Patrick : University of Wisconsin Madison

DUE-9353930
Improving Science Education in the University of Wisconsin Centers
PI: Janice Alexander $58,218 ($58,218)
University of Wisconsin Madison Madison, WI 53706-1490
UNDERGRADUATE FACULTY ENHANCEMENT PROGRAM
CoPI: Paul Martino : University of Wisconsin Fox Valley

DUE-9451135
Laboratory for Environmental Remote Sensing and GIS
PI: Shamim Naim $16,492 ($16,492)
University of Wisconsin Waukesha Madison, WI 53706-1490
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

DUE-9452181
Recycling Technologies in Integrated Papermaking System
PI: Mary Lee Rudnick-Kaun $75,000 ($75,000)
Fox Valley Technical College Appleton, WI 54914-1643
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

DUE-9452553
Integration of X-ray Micronanalysis and Image Processing between a New Associate Degree Program in Electron Microscopy and Other Disciplines
PI: Glenn Boda $49,615 ($49,615)
Madison Area Technical College Madison, WI 53703-2285
UNDERGRADUATE INSTRUMENTATION & LABORATORY IMPROVEMENT

WYOMING

ESI-9256067
Environmental Chemistry, Biology, and Geology Research in Yellowstone National Park
PI: David Barkan $57,267 ($112,414)
Northwest Community College Powell, WY 82435-1898
YOUNG SCHOLARS PROGRAM

Appendix IV

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TECHNOLOGY REINVESTMENT PROJECT
AWARDS TO TWO-YEAR COLLEGES

DUE-9453739
Washington State Manufacturing Technology Standards, Competencies and Curriculum Development
PI: Jerry Riehl — $429,680 ($429,680)
Seattle Community College South Campus — Seattle, WA 98106-1401
ARPA-MANUFACTURING ENGINEERING EDUCATION

EEC-9409189
Burlington County Technical Training Institute Network for Manufacturing Education and Training
PI: Joseph Laufer — $200,000 ($600,000)
Burlington County College — Pemberton, NJ 8068
ARPA-MANUFACTURING ENGINEERING EDUCATION

EEC-9409190
Partnership for Retraining and Innovations in Delivering Education (PRIDE)
PI: Ronald Smith — $2,000,000 ($2,000,000)
Drexel University — Philadelphia, PA 19104
ARPA-MANUFACTURING ENGINEERING EDUCATION
In partnership with: Camden County College, Delaware County Community College, Community College of Philadelphia

EEC-9409191
Establishment of Northwestern Pennsylvania Technical College Manufacturing Education and Training Center
PI: John Nesbit — $636,380 ($900,000)
Erie County Technical Institute — Erie, PA 16504-2603
ARPA-MANUFACTURING ENGINEERING EDUCATION

EEC-9411521
Palm Beach RETRAIN (Regional Education Training Alliance for Changing Industrial Needs)
PI: Vernon Roan — $670,000 ($1,130,000)
University of Florida — Gainesville, FL 32611
ARPA-MANUFACTURING ENGINEERING EDUCATION
In partnership with: Indian River Community College, Palm Beach Community College

EEC-9411524
SUNY Farmingdale Regional Center for Work Force Education
PI: Ann Diehl — $485,411 ($1,000,000)
SUNY Farmingdale — Farmingdale, NY 11735
ARPA-MANUFACTURING ENGINEERING EDUCATION

EEC-9414218

Intermountain Manufacturing Education and Training (IMET)

PI: David Norton $271,158 ($800,000)

Utah State University Foundation Logan, UT 84321-1947

ARPA-TRP-MANUFACTURING ENGINEERING EDUCATION

In partnership with: Salt Lake City Community College, Utah Valley State College

ECS-9414220

Oregon Institute of Technology/Industry/ Community College Partnership for Retraining the Workforce in Microelectronics in Oregon

PI: John Yarbrough $614,000 ($614,000)

Oregon Institute of Technology Klamath Falls, OR 97601-8801

ARPA-TRP-MANUFACTURING ENGINEERING EDUCATION

In partnership with: Portland Community College, Mt. Hood Community College, Linn Benton Community College, Chemeketa Community College

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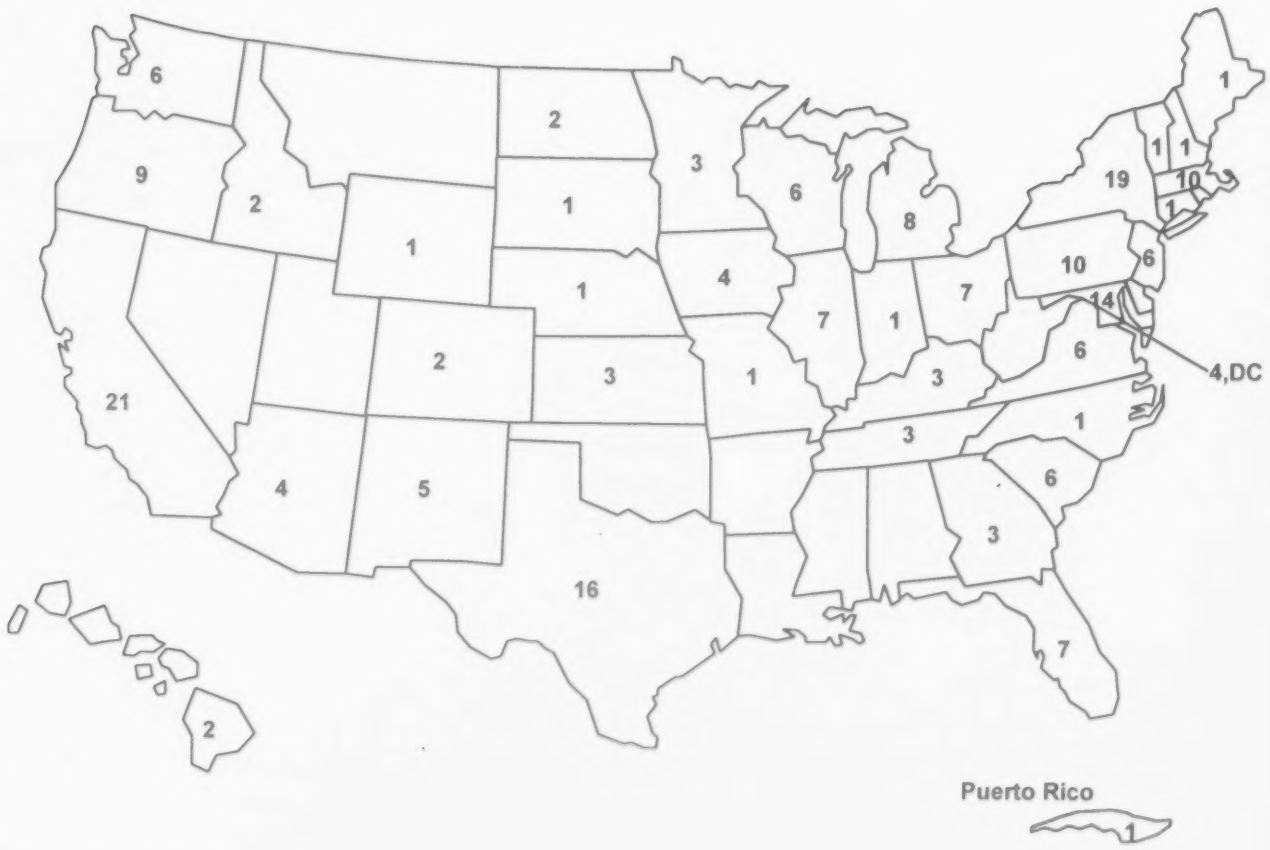
FY1994 Awards to Two-Year Colleges



This map includes the 204 awards listed in Appendix III plus four IPA's (Maryland, New Jersey, Florida and Colorado) awards and one contract (IL) for a total of 209 awards as listed in Table I.

STIS

The Science & Technology Information System (STIS) at the National Science Foundation

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- Press releases. Other NSF news items
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- NSF vacancy announcements
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FTP to *stis.nsf.gov*. Enter *anonymous* for the username, and your E-mail address for the password. Retrieve the file "index". This contains a list of the files available on STIS and additional instructions.

Getting Started with The On-Line System

If you are on the Internet: *telnet stis.nsf.gov*. At the login prompt, enter *public*.

If you are dialing in with a modem: Choose 1200, 2400, or 9600 baud, 7-E-1. Dial (703) 306-0212 or (703) 306-0213

When connected, press *Enter*. At the login prompt, enter *public*.

Getting Started with Direct E-Mail

Send an E-mail message to the Internet address **stisserv@nsf.gov**. Put the following in the text:

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You will receive instructions for this service.

Getting Started with Gopher and WAIS

The NSF Gopher server is on port 70 of **stis.nsf.gov.** The WAIS server is also on **stis.nsf.gov.** You can get the ".src" file from the "Directory of Servers" at **quake.think.com.** For further information contact your local computer support organization.

For Additional Assistance Contact:

E-mail: *stis@nsf.gov* (Internet)

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TDD: (703) 306-0090

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